United States
Department of
Agriculture

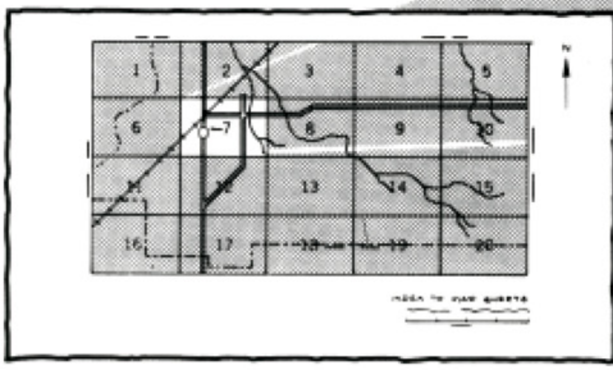
Soil
Conservation
Service

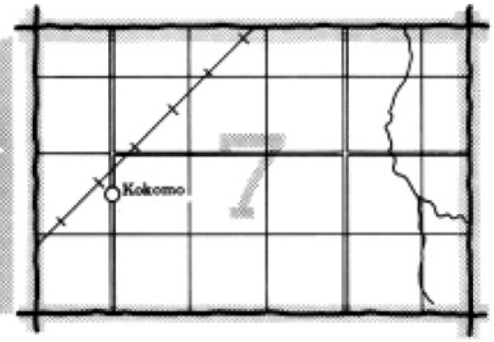
In cooperation with
the Iowa Agriculture
and Home Economics
Experiment Station;
the Cooperative Extension
Service, Iowa State
University; and Department
of Soil Conservation,
State of Iowa

Soil Survey of Henry County Iowa

HOW TO USE

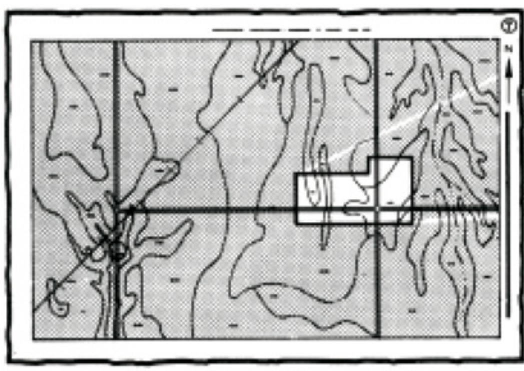
1. Locate your area of interest on the "Index to Map Sheets"

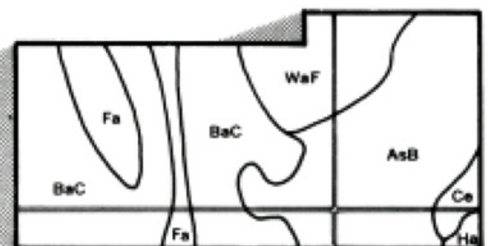




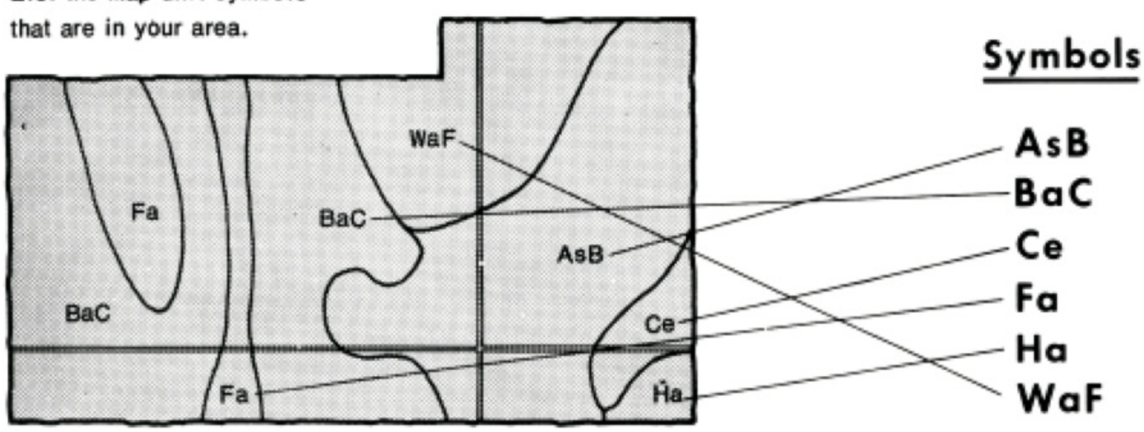
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



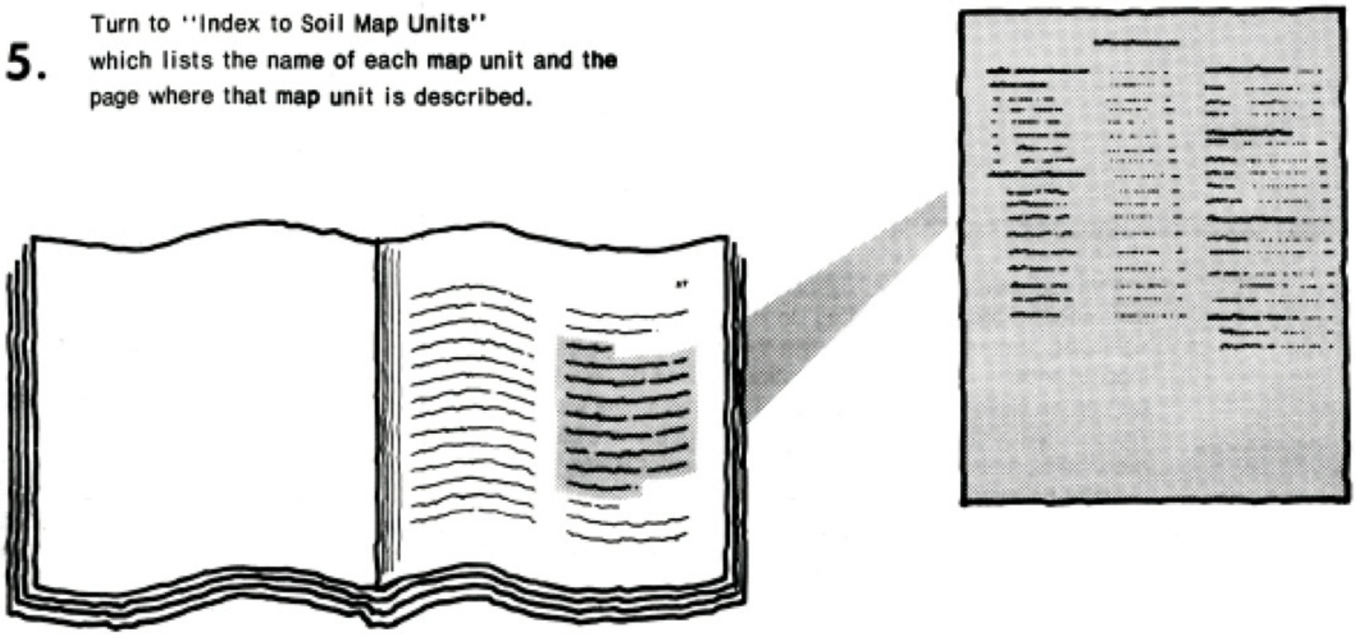


4. List the map unit symbols that are in your area.

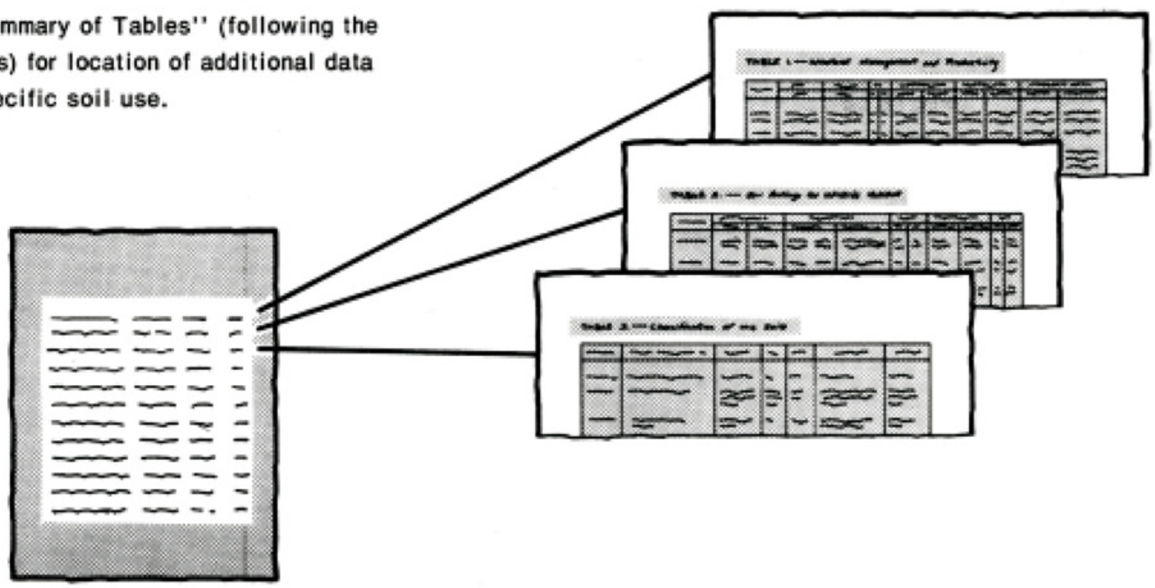


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This soil survey was made cooperatively by the Soil Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Department of Soil Conservation, State of Iowa. It is part of the technical assistance furnished to the Henry County Soil Conservation District. Funds appropriated by Henry County were used to defray part of the cost of the survey. Major fieldwork for this survey was completed in 1981. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Soybeans growing on Mahaska silty clay loam, 2 to 5 percent slopes.

Contents

Soil Series

Issued August 1985

Index to Map Units

Summary of Tables

Preface

This soil survey contains information that can be used in land-planning programs in Henry Couty, Iowa. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land uses, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Soil Survey of Henry County, Iowa

By James E. Seaholm, Soil Conservation Service

Fieldwork by James E. Seaholm, Asghar A. Chowdhery, Alan A. Belinskas, and Jerry M. Storke, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service
In cooperation with
the Iowa Agriculture and Home Economics Experiment Station;
the Cooperative Extension Service, Iowa State University;
and the Department of Soil Conservation, State of Iowa

Henry County is in the southeastern part of Iowa (fig. 1). It is bounded on the east by Des Moines and Louisa Counties, on the north by Louisa and Washington Counties, on the west by Jefferson and Van Buren Counties, and on the south by Lee County. Mount Pleasant, the county seat, is about 132 miles southeast of Des Moines, the state capital. The county has an area of about 281,600 acres, or about 440 square miles.

Much of the land area of the county is in farms and is used mainly for corn, soybeans, oats, hay, and pasture. A small area, mainly along the Skunk River and its tributaries, is woodland. Corn and soybeans are the main grain crops. Raising hogs and feeding beef cattle are the principal livestock enterprises. The climate is subhumid and continental. The winters are cold, and the summers are warm. The growing season is long enough for all common crops to mature.

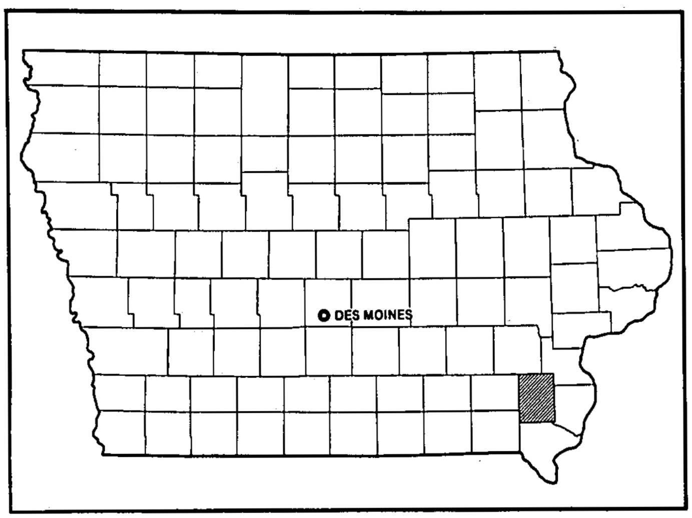


Figure 1.—Location of Henry County in Iowa.

General Nature of the Survey Area

This section gives general information concerning the county. It discusses climate, drainage, relief, history, agriculture, and transportation.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Henry County is cold in winter and is quite hot with occasional cool spells in summer. Precipitation during the winter frequently occurs as snowstorms, and during the warm months it is chiefly showers, often heavy, when warm moist air moves in from the south. Total annual rainfall is normally adequate for corn, soybeans, and small grains.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Mount Pleasant, Iowa, in the period 1951 to 1971. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 16

degrees. The lowest temperature on record, which occurred at Mount Pleasant on February 9, 1979, is -24 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Mount Pleasant on July 27, 1956, is 102 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 34.80 inches. Of this, 23 inches, or 65 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5.70 inches at Mount Pleasant on August 5, 1970. Thunderstorms occur on about 50 days each year, and most occur in summer.

Tornadoes and severe thunderstorms strike occasionally. These storms are local and of short duration, and result in sparse damage in narrow belts. Hailstorms occur at times during the warmer part of the year in irregular patterns and in relatively small areas.

The average seasonal snowfall is 26 inches. The greatest snow depth at any one time during the period of record was 34 inches. On an average of 20 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12 miles per hour, in spring.

Drainage

The Skunk River and its tributaries drain about 99 percent of the county. Flint Creek, northeast of New London, drains about 1 percent of the county and flows into the Mississippi River. Crooked, Sugar, and Mud Creeks enter the Skunk River from the east and drain the north, northeast, and northwest parts of the county. Big and Mud Creeks drain the central, east-central, south-central, and southeast parts of the county and flow into the Skunk River from the north. Cedar and Fish Creeks drain the southwest part of the county and flow into the Skunk River. The Skunk River enters Henry County in the northwest. After winding along the western border for about 5 miles, it flows in a southeasterly direction and leaves the county in the southeast corner (*12*).

In most parts of Henry County, natural drainage is adequate. However, artificial drainage is needed in nearly level to slightly depressional areas on the broad upland divides in some parts of the county.

Relief

Henry County has a great range in local relief. Slopes vary from nearly level to very steep. The least amount of relief is on the broadest, most stable part of the upland divides and on the bottom lands along the larger drainageways. The broadest, least dissected divides are in the northern and northeastern parts of the county. In these areas, most of the land is nearly level to gently sloping, and the bottom of the drainageways ranges from 20 to 60 feet below the top of the divides. The greatest amount of relief is along the edges of the valleys of the Skunk River, Cedar Creek, and Big Creek. The valley bottom is often 110 to 200 feet lower than the top of the adjacent upland divides. The southern half and northwestern parts of the county are generally heavily dissected by many creeks and seasonal drains. Slopes can range from nearly level to steep within a short distance.

The highest elevation in Henry County, about 800 feet, is 1.5 miles north of New London. The lowest elevation, about 530 feet, is the southeastern border of the county where the Skunk River leaves the county.

History

The present area of Henry County was within the boundaries of the Sac and Fox Cession of September 21, 1832, known as the Black Hawk Purchase. Henry County was formed in 1836 from a part of the original Demoine County. It was named in honor of General James Dougherty Henry of Illinois, who had gained fame in the Black Hawk War (*7*). The county was reduced in size and given its present boundaries by the Iowa Legislature in January 1839 (*3*).

The first settler in the area was Abraham C. Dover, who established claims on the present site of New London in the fall of 1833. Presley Saunders claimed the land now known as Mount Pleasant in the fall of 1834. In the same year the first grist mill in the area was erected near Big Creek in Marion Township.

The county government was organized in January 1837 with the election of County Commissioners Robert Caulk, Samuel Brazelton, and George Sharpe (*7*). Mount Pleasant was designated as the county seat. The first courthouse in Iowa was built in Mount Pleasant in 1839.

In 1856, the first railroad in the county, a line between Burlington and Mount Pleasant, was completed. By 1893, a network of railroads had been built through all parts of the county to provide outlets for farm products

and to supply the people of the county with the goods they needed.

The population of Henry County was 3,772 in 1840. It had increased to 21,463 by 1870. In 1980, according to the census of that year, the population was 18,718, of which 7,263, or more than 38 percent, lived in Mount Pleasant (*25*).

Iowa's first college was founded in Mount Pleasant in 1842 and became Iowa Wesleyan. The college offers a 4-year curriculum in liberal arts.

The most important event in the county is the annual reunion of the Midwest Old Settlers and Threshers Association. It is the largest event of its kind in the nation and brings more than 250,000 visitors to Mount Pleasant during Labor Day week. The reunion features authentic working models of more than 100 steam-powered threshing machines, a narrow gauge railway, a saw mill, antique autos, and the demonstration of different trades (*7*).

Agriculture

The recent trend in the county has been toward a gradual decrease in the number of farms and an increase in the average size of the farms. The average age of the county's farmers has decreased in recent years. In 1980, about 35 percent of the people in Henry County lived on farms.

In 1980, there were 990 farms in the county, and the average size was 244 acres (*5*). Corn and soybeans were the main row crops. Agriculture has been of prime importance to the county and continues to be a vital part of the total economy. It supports not only farmers but also many business, professional, financial, and agri-business activities.

There are about 440 square miles of land in Henry County, or a total of 281,600 acres. Of this total acreage, about 230,000 acres are tillable. Although fewer and larger farms account for the overall increased production, increased efficiency also has much to do with farm output.

The total crop and livestock production expenses in any one year could be nearly half of the total cash receipts. These expenses include seed, fertilizer, chemicals, fuel, oil, machinery, feed for livestock, and other products, most of which are purchased locally.

Transportation

Two major highways come into Henry County and intersect at Mount Pleasant. U.S. Highway 34 runs east and west, and U.S. Highway 218 runs north and south. Hard-surface state and county roads connect these highways to all the smaller communities. All farms have access to farm-to-market roads of gravel or crushed limestone. Major county roads are well distributed throughout the county.

One railroad traverses the county east and west through New London, Mount Pleasant, and Rome. Bus transportation and passenger rail service are available in Mount Pleasant. Motor freight lines serve every trading center in the county.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind

and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

This soil survey supersedes the soil survey of Henry County published in 1919 (*22*). This survey provides additional information and contains larger maps that show the soils in greater detail.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed, and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each soil association on the general soil map is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Taintor-Mahaska-Kalona Association

Nearly level and level, poorly drained and somewhat poorly drained, silty soils formed in loess; on uplands

This association consists of soils on broad flats that are 1 mile to 3 miles wide. The soils formed in loess under a native vegetation of prairie grasses. Slopes range from 0 to 2 percent.

This association covers about 15 percent of the county. About 50 percent of the association is Taintor soils, about 25 percent is Mahaska soils, about 20 percent is Kalona soils, and about 5 percent is soils of minor extent.

Taintor soils are on broad flats and are nearly level and poorly drained. Mahaska soils are on the outer edge of the flats and are nearly level and somewhat poorly drained. Kalona soils are in the center of the flats and are level and poorly drained.

Typically, the surface layer of the Taintor soils is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark gray silty clay loam about 9 inches thick. The subsoil is about 30 inches thick. The upper part is dark gray, mottled, firm silty clay; the middle part is gray, mottled, firm silty clay; and the lower part is gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is gray, mottled silt loam.

Typically, the surface layer of the Mahaska soils is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Typically, the surface layer of the Kalona soils is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark gray silty clay loam about 7 inches thick. The subsoil is about 27 inches thick. The upper part is dark gray, mottled, firm silty clay loam; the middle part is gray and olive gray, mottled, firm silty clay loam; and the lower part is light olive gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is light olive gray, mottled silt loam.

The minor soils in this association are the Otley and Sperry soils. The very poorly drained Sperry soils are in slight depressions on the broad flats, and the moderately well drained Otley soils are on the upper part of side slopes at the outer edge of the flats.

The soils in this association are used mainly for cultivated crops. The soils are well suited to row crops. The main enterprises are growing corn and soybeans as cash crops and raising and feeding hogs. The main concerns in management are controlling the seasonal high water table and maintaining tilth and fertility.

2. Otley-Mahaska-Nira Association

Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess; on uplands

This association consists of soils on wide ridgetops, in coves at the head of drainageways, and on the convex upper part of side slopes. The soils are adjacent to broad flats that are 1 mile to 3 miles wide. They formed in loess under a native vegetation of prairie grasses. Slopes range from 0 to 9 percent.

This association covers about 18 percent of the county. About 40 percent of the association is Otley soils, about 26 percent is Mahaska soils, about 9 percent is Nira soils, and about 25 percent is soils of minor extent.

Figure 2.—Small pasture on moderately sloping Otley soils adds esthetic value to this farmstead in the intensively cultivated Otley-Mahaska-Nira association.

The moderately well drained, gently sloping and moderately sloping Otley soils are on convex ridgetops and upper side slopes. Mahaska soils are somewhat poorly drained and nearly level to moderately sloping. They are on ridgetops, in coves at the head of drainageways, and on the upper part of side slopes. Nira soils are moderately well drained and moderately sloping. They are in coves at the head of drainageways and on convex side slopes.

Typically, the surface layer of the Otley soil is black silty clay loam about 9 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam. The subsoil is about 33 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown and grayish brown, firm silty clay loam grading with depth to light brownish gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is light olive gray, mottled silty clay loam.

Typically, the surface layer of the Mahaska soil is black silty clay loam about 10 inches thick. The subsurface layer is black and very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is dark grayish brown and grayish brown, mottled, firm silty clay loam; and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Typically, the surface layer of the Nira soils is black silty clay loam about 8 inches thick. The subsurface layer

is very dark grayish brown silty clay loam about 5 inches thick. The subsoil is about 34 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown and grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

The minor soils in this association are the Adair, Armstrong, Clarinda, Colo, Ladoga, Rinda, and Taintor soils. The poorly drained, alluvial Colo soils are along drainageways. The poorly drained Taintor soils are on broad flats above the Mahaska soils, and the poorly drained, very slowly permeable Clarinda and Rinda soils are on the lower part of side slopes. The loamy Adair and Armstrong soils are also on side slopes.

The soils in this association are used mainly for cultivated crops. Permanent pastures are confined to the more sloping areas (fig. 2).

Most of the soils are well suited or moderately suited to row crops. In about 50 percent of the areas, the soils are nearly level or gently sloping and are well suited to row crops. The main enterprises are growing corn and soybeans as cash crops and raising and feeding hogs. The main concerns in management are controlling erosion and maintaining tilth and fertility.

3. Ladoga-Givin-Hedrick Association

Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess; on uplands

This association consists of soils on moderately wide, convex ridgetops, in coves at the head of drainageways, and on the convex upper part of side slopes. A well developed network of drainageways is also characteristic of this association. The soils formed in loess under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 0 to 9 percent.

This association covers about 13 percent of the county. About 40 percent of the association is Ladoga soils, about 10 percent is Givin soils, about 7 percent is Hedrick soils, and about 43 percent is soils of minor extent.

Ladoga soils are moderately well drained and gently sloping and moderately sloping. They are on ridgetops and the upper part of side slopes (fig. 3). Givin soils are somewhat poorly drained and nearly level and gently sloping. They are on ridgetops and the upper part of side slopes. Hedrick soils are moderately well drained and gently sloping and moderately sloping. They are in coves at the head of drainageways and on the upper part of side slopes.

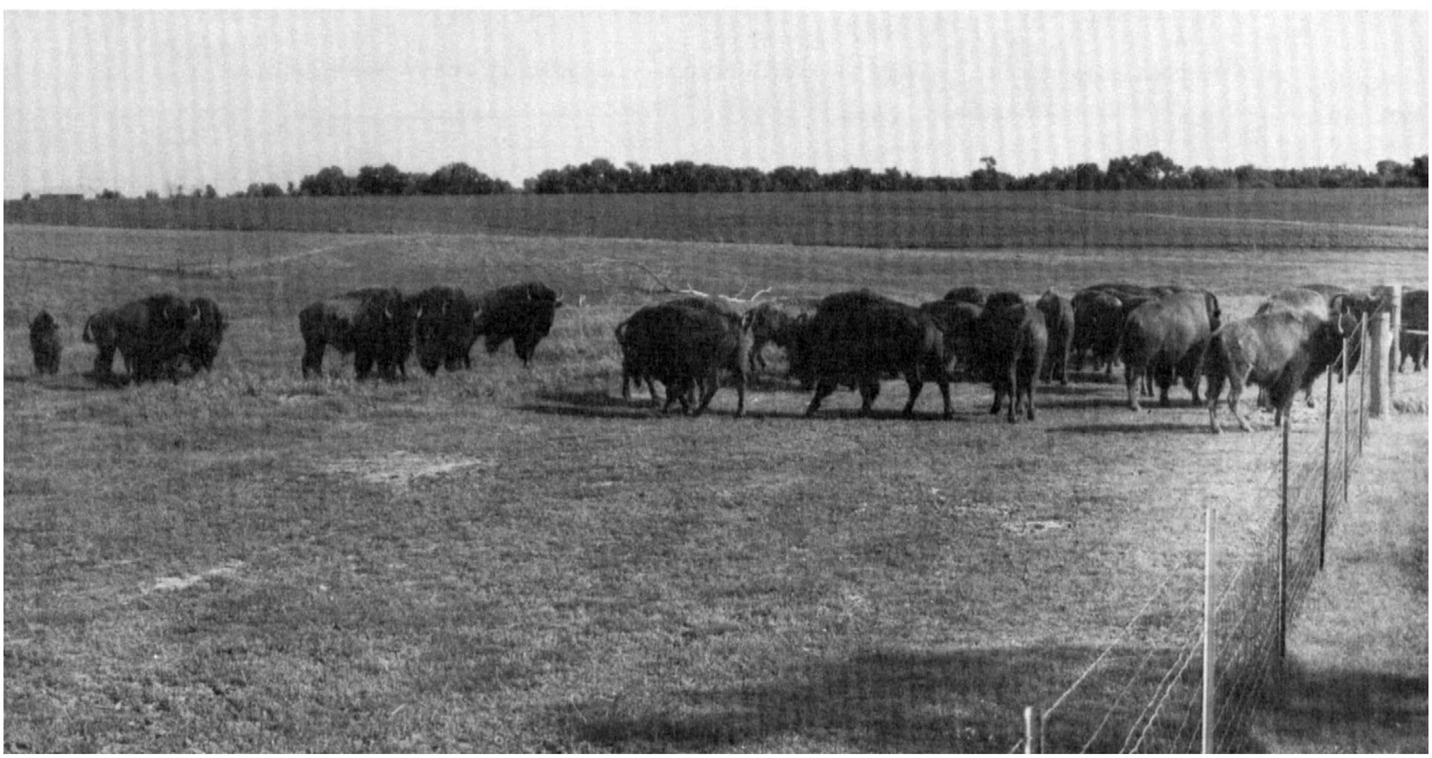


Figure 3.—A herd of American buffalo (bison) grazing on moderately sloping Ladoga soils in the Ladoga-Givin-Hedrick association.

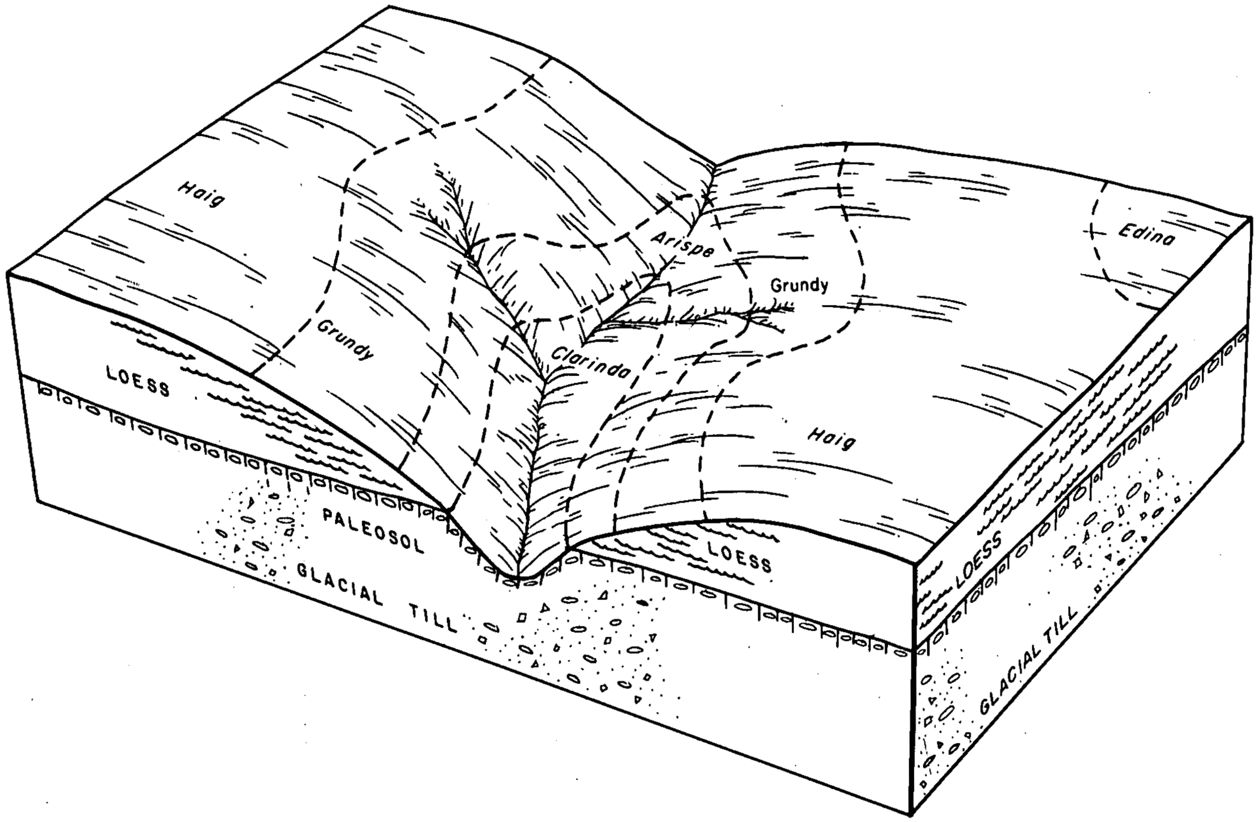


Figure 4.—Typical pattern of soils and underlying material in the Haig-Grundy-Arispe association.

Typically, the surface layer of the Ladoga soils is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled silty clay loam.

Typically, the surface layer of the Givin soils is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 41 inches thick. The upper part is brown, mottled, friable silty clay loam; the middle part is dark grayish brown and grayish brown, mottled, firm silty clay loam and silty clay; and the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

Typically, the surface layer of the Hedrick soils is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is brown, firm silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches is light brownish gray, mottled silty clay loam.

The minor soils in this association are the Armstrong, Clinton, Colo, Gara, Lineville, Otley, Rinda, and Vesser soils. The very slowly permeable Rinda soils are in coves at the head of drainageways and on the lower part of side slopes. The loamy Armstrong, Gara, and Lineville soils are on side slopes. The lighter colored and thinner surfaced Clinton soils are on the upper part of side slopes, and the alluvial Vesser and Colo soils are in drainageways.

The soils in this association are used mainly for cultivated crops. Permanent pastures are confined to the more sloping areas of the association. Most of the trees are in groves or windbreaks near farm buildings or along drainageways in the more sloping areas.

In about 80 percent of the areas, the soils are well suited or moderately well suited to row crops. In about 33 percent of the areas, the soils are nearly level or

gently sloping and are well suited to row crops. The main enterprises are growing corn and soybeans for cash crops and raising and feeding hogs and beef cattle. The main concerns in management are controlling erosion and maintaining tilth and fertility.

4. Haig-Grundy-Arispe Association

Nearly level to moderately sloping, poorly drained to moderately well drained, silty soils formed in loess; on uplands

This association consists of soils on broad flats, on convex ridgetops, on the convex upper part of side slopes, and in coves at the head of drainageways. The soils formed in loess under a native vegetation of prairie grasses. Slope ranges from 0 to 9 percent.

This association (fig. 4) covers about 5 percent of the county. About 45 percent of the association is Haig soils, about 30 percent is Grundy soils, about 10 percent is Arispe soils, and about 15 percent is soils of minor extent.

The Haig soils are on the broad flats and are nearly level and poorly drained (fig. 5). The Grundy soils are on the ridgetops and the upper part of side slopes and are gently sloping and somewhat poorly drained (fig. 6). The Arispe soils are on the upper part of side slopes and in the coves. They are moderately sloping and moderately well drained or somewhat poorly drained.

Typically, the surface layer of the Haig soils is black silt loam about 9 inches thick. The subsurface layer is black and very dark gray silty clay loam about 8 inches thick. The subsoil is more than 43 inches thick. The upper part is very dark gray and dark gray, mottled, very firm silty clay; the middle part is olive gray, mottled, very firm silty clay; and the lower part is light olive gray, mottled, firm and friable silty clay loam.

Typically, the surface layer of the Grundy soils is black silt loam about 10 inches thick. The subsurface layer is very dark gray silty clay loam about 6 inches thick. The subsoil is about 34 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; and the lower

Figure 5.—Typical landscape of Haig silt loam on broad flats in the Haig-Grundy-Arispe association.

Figure 6.—Tile outlet terraces on gently sloping Grundy soils in the Haig-Grundy-Arispe association.

part is grayish brown and olive gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is olive gray, mottled silty clay loam.

Typically, the surface layer of the Arispe soils is black silty clay loam about 9 inches thick. The subsoil is about 39 inches thick. The upper part is very dark gray, friable silty clay loam; the middle part is dark grayish brown, mottled, firm silty clay loam; and the lower part is grayish brown, mottled, firm and friable silty clay loam. The substratum to a depth of about 60 inches is grayish brown, mottled silty clay loam.

The minor soils are the Clarinda, Edina, Pershing, and Rinda soils. The poorly drained, very slowly permeable Edina soils are in slight depressions or in level areas on broad flats. The very slowly permeable Clarinda and Rinda soils are in coves at the head of drainageways and on the lower part of side slopes. The moderately well drained or somewhat poorly drained Pershing soils are on the upper part of side slopes. They are lighter in color than the dominant soils and have a thinner surface layer.

The soils in this association are used mainly for cultivated crops. Permanent pastures are confined to the more sloping areas of the association.

Most of the soils are well suited or moderately suited to row crops. In about 75 percent of the areas, the soils are nearly level or gently sloping and are well suited to row crops. The main enterprises are growing corn and soybeans for cash crops and raising and feeding hogs and beef cattle. Controlling the seasonal high water table and erosion and maintaining tilth and fertility are the main concerns in management.

5. Pershing-Belinda-Rinda Association

Nearly level to strongly sloping, moderately well drained to poorly drained, silty soils formed in loess and glacial till; on uplands

This association consists of soils on moderately wide ridgetops and on short, convex side slopes. A well developed network of drainageways is also characteristic of this association. Pershing and Belinda soils formed in loess, and Rinda soils formed in glacial till. These soils developed under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 0 to 14 percent.

This association covers about 12 percent of the county. About 50 percent of the association is Pershing soils, about 9 percent is Belinda soils, about 7 percent is Rinda soils, and about 34 percent is soils of minor extent.

Pershing soils are on convex ridgetops and the upper part of side slopes. They are gently sloping and moderately sloping and moderately well drained or somewhat poorly drained. The nearly level, poorly drained Belinda soils are on flats on upland divides. Rinda soils are at the head of drainageways and on the lower part of side slopes. They are moderately sloping and strongly sloping and somewhat poorly drained or poorly drained.

Typically, the surface layer of the Pershing soil is very dark gray silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is more than 48 inches thick. The upper part is yellowish brown and dark grayish brown, friable silty clay loam; the middle part is dark grayish brown and grayish brown, very firm silty clay; and the lower part is dark grayish brown and light brownish gray, firm silty clay loam grading with depth to friable silty clay loam.

Typically, the surface layer of the Belinda soil is very dark gray silt loam about 9 inches thick. The subsurface layer is dark gray silt loam grading with depth to grayish brown silt loam. It is about 9 inches thick. The subsoil is more than 42 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is olive gray and light olive gray, mottled, firm silty clay loam.

Typically, the surface layer of the Rinda soil is very dark grayish brown silty clay loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of dark grayish brown silty clay subsoil material into the surface layer. The subsoil is about 42 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is dark grayish brown, mottled, very firm clay; and the lower part is gray, mottled, very firm clay. The substratum to a depth of about 60 inches is gray, mottled clay.

The minor soils in this association are the Armstrong, Gara, Keswick, and Weller soils. The loamy Armstrong, Gara, and Keswick soils are on side slopes. The moderately well drained Weller soils are on the upper part of side slopes and are lighter in color and have a thinner surface layer.

The soils in this association are used mainly for cultivated crops. Permanent pastures are confined to the more sloping areas of the association. Most of the trees are in groves or windbreaks near farm buildings or are along drainageways in the more sloping areas.

In about 75 percent of the areas, the soils are moderately suited to row crops. The main enterprises are growing corn and soybeans for cash crops and raising and feeding hogs and beef cattle. Controlling the seasonal high water table and erosion and maintaining tilth and fertility are the main concerns in management.

6. Clinton-Lindley-Keswick Association

Gently sloping to very steep, moderately well drained and well drained, silty and loamy soils formed in loess and glacial till; on uplands

This association consists of soils on long, narrow ridgetops and short, convex to straight side slopes. A well developed network of drainageways is also characteristic of this association. Clinton soils formed in loess, and Lindley and Keswick soils formed in glacial till. These soils developed under a native vegetation of deciduous trees. Slopes range from 2 to 40 percent.

This association (fig. 7) covers about 10 percent of the county. About 38 percent of the association is Clinton soils, about 22 percent is Lindley soils, about 10 percent is Keswick soils, and about 30 percent is soils of minor extent.

Clinton soils are moderately well drained and are gently sloping and moderately sloping on the convex ridgetops and gently sloping to strongly sloping on the upper part of side slopes. Lindley soils are on side slopes and are strongly sloping to very steep and well drained. Keswick soils are on side slopes below Clinton soils and above Lindley soils. They are strongly sloping to moderately steep and are well drained.

Typically, the surface layer of the Clinton soil is dark grayish brown silt loam about 6 inches thick. As a result of plowing, there are streaks and pockets of brown silty clay loam subsoil material in the surface layer. The subsoil is about 37 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, friable silty clay loam. The substratum to a depth of about 60 inches is yellowish brown and grayish brown silty clay loam.

Typically, the surface layer of the Lindley soils is very dark gray loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 36 inches thick. The substratum to a depth of about 60 inches is yellowish brown loam.

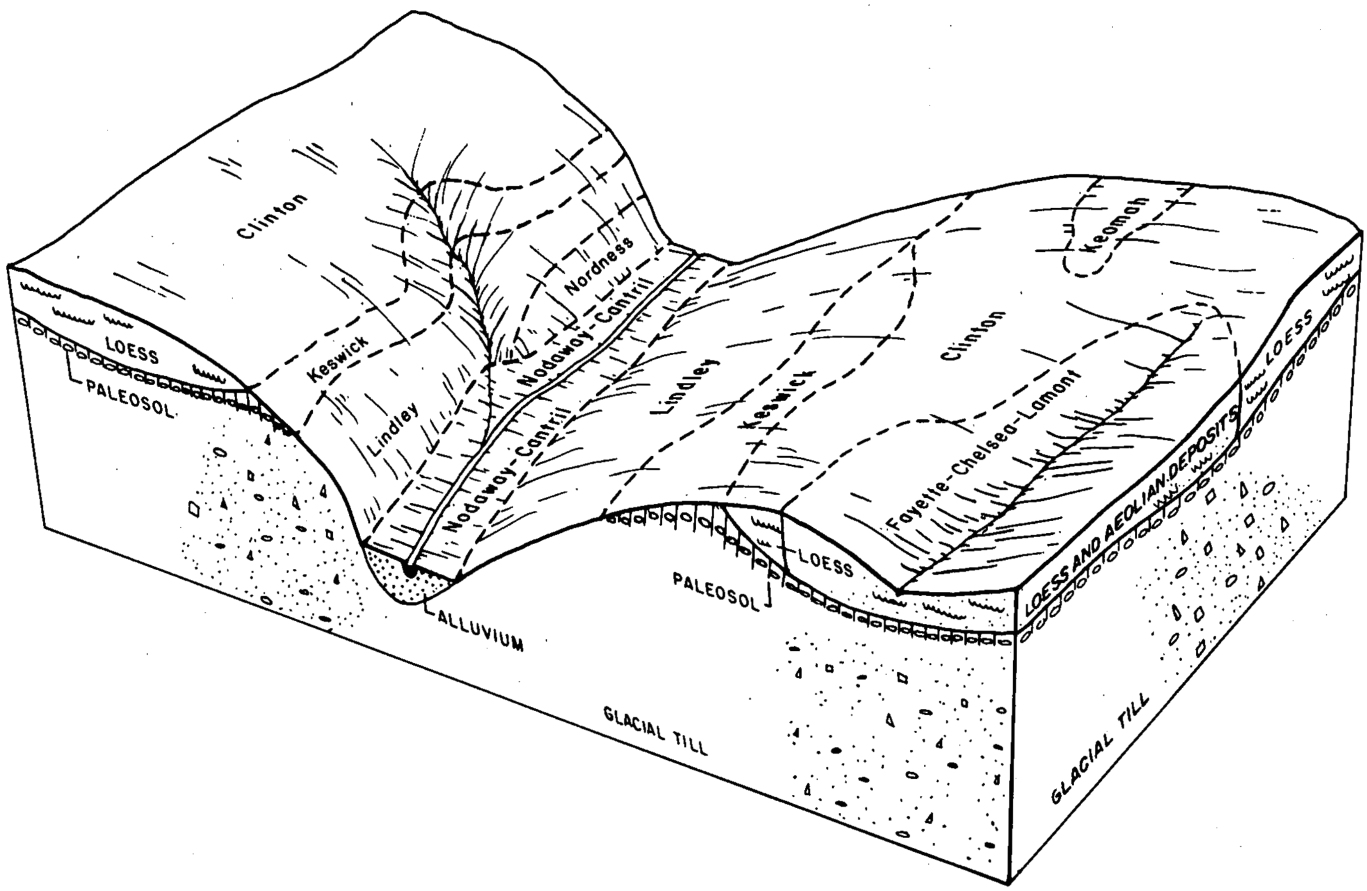


Figure 7.—Typical pattern of soils and underlying material in the Clinton-Lindley-Keswick association.

Typically, the surface layer of the Keswick soils is dark grayish brown loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of strong brown clay loam subsoil material into the surface layer. The subsoil is more than 55 inches thick. The upper part is strong brown, mottled, firm clay loam; the middle part is reddish brown and strong brown, mottled, very firm clay; and the lower part is yellowish brown, mottled, firm clay loam.

The minor soils in this association are the Cantril, Chelsea, Clinton, Fayette, Keomah, Lamont, Nodaway, and Nordness soils. The somewhat poorly drained Keomah soils are on moderately wide, convex ridgetops. The well drained, moderately rapidly permeable Lamont soils and the excessively drained Chelsea soils are on narrow, convex ridgetops and short, convex to straight side slopes. The well drained Nordness soils, which are on the lower part of side slopes, are shallow over limestone bedrock. The somewhat poorly drained Cantril soils are on foot slopes below the Lindley soils, and the moderately well drained, alluvial Nodaway soils are along drainageways.

The Keswick soils have a seasonal high water table. Permeability is moderately slow for the Clinton and Lindley soils, and it is slow for the Keswick soils.

In about 60 percent of the areas, the soils are used for cultivated crops. The steeper soils on the lower part of side slopes are used mostly for hay and pasture. In some areas, the soils are used as woodland and habitat for wildlife.

In about 50 percent of the areas, the soils are moderately suited or well suited to row crops. In about 10 percent of the areas, the soils of this association are gently sloping and are well suited to row crops. The main enterprises are growing corn and soybeans as cash crops and raising and feeding hogs, sheep, and beef cattle. The main concerns in management are controlling erosion and maintaining tilth and fertility.

7. Weller-Lindley-Keswick Association

Gently sloping to very steep, moderately well drained and well drained, silty and loamy soils formed in loess and glacial till; on uplands

This association consists of soils on long, narrow ridgetops and on short, convex to straight side slopes. A well developed network of drainageways is characteristic of areas of this association. Weller soils formed in loess, and Lindley and Keswick soils formed in glacial till. These soils developed under a native vegetation of deciduous trees. Slopes range from 2 to 40 percent.

This association (fig. 8) covers about 20 percent of the county. About 32 percent of the association is Weller soils, about 24 percent is Lindley soils, about 9 percent is Keswick soils, and about 35 percent is soils of minor extent.

Weller soils are moderately well drained and are gently sloping and moderately sloping on convex ridgetops and gently sloping to strongly sloping on the upper part of side slopes. Lindley soils are on side slopes and are gently sloping to very steep and well drained. Keswick soils are on side slopes below Weller soils and above Lindley soils. They are strongly sloping to moderately steep and moderately well drained.

Typically, the surface layer of the Weller soils is dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is more than 48 inches thick. The upper part is yellowish brown, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm and friable silty clay loam.

Typically, the surface layer of the Lindley soils is very dark gray loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is yellowish brown, firm clay loam about 36 inches thick. The substratum to a depth of about 60 inches is yellowish brown loam.

Typically, the surface layer of the Keswick soils is dark grayish brown loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of strong brown clay loam subsoil material into the surface layer. The subsoil is more than 55 inches thick. The upper part

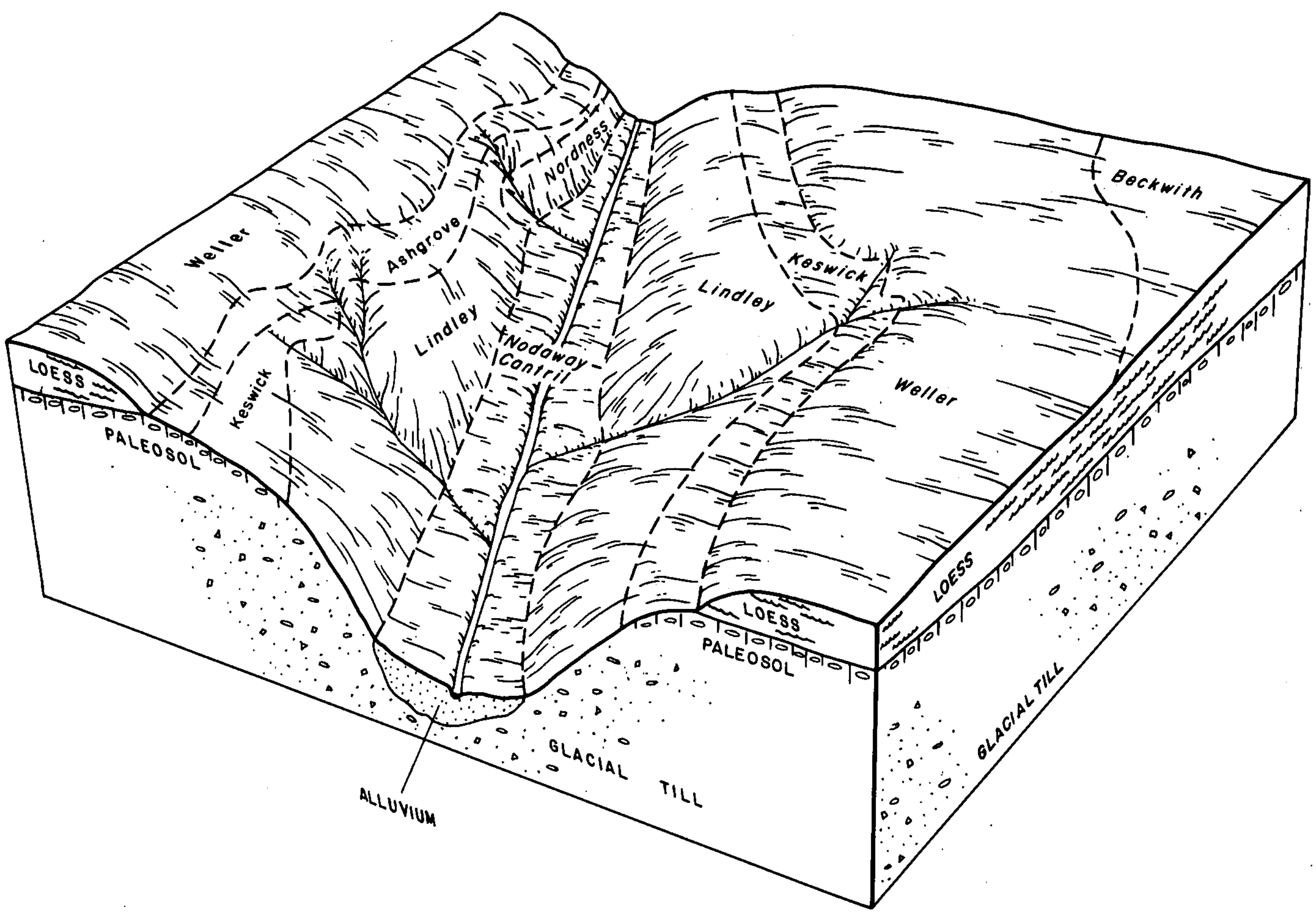


Figure 8.—Typical pattern of soils and underlying material in the Weller-Lindley-Keswick association.

Figure 9.—No-till planted corn is suited to the moderately sloping Weller soils in the Weller-Lindley-Keswick association.

is strong brown, mottled, firm clay loam; the middle part is reddish brown and strong brown, mottled, very firm clay; and the lower part is yellowish brown, mottled, firm clay loam.

The minor soils in this association are the Cantril, Clinton, Douds, Nodaway, and Nordness soils. The moderately well drained Clinton soils are on ridgetops and the upper part of side slopes. Nordness soils are shallow over limestone bedrock on the lower part of side slopes. The Douds soils are similar to the Lindley soils. The somewhat poorly drained, alluvial Cantril soils are on foot slopes below the Lindley soils, and the alluvial Nodaway soils are along drainageways.

The Weller and Keswick soils have a seasonal high water table. Permeability is slow in the Weller and Keswick soils and moderately slow in the Lindley soils.

In about half the areas of this association (the ridgetops and the upper part of side slopes), the soils are used for cultivated crops (fig. 9). The steeper soils on the lower part of side slopes are used mostly for hay and pasture. In some areas the soils are used as woodland and habitat for wildlife.

In about 50 percent of the areas, the soils are moderately suited to row crops. The main enterprises are growing corn and soybeans for cash crops and raising and feeding hogs, sheep, and beef cattle. Controlling erosion and maintaining tilth and fertility are the main concerns in management.

8. Nodaway-Colo Association

Nearly level and gently sloping, moderately well drained and poorly drained, silty soils formed in recent alluvium; on bottom lands

This association consists of soils on flood plains of the major and minor streams in the county. Slopes range from 0 to 5 percent.

This association covers about 7 percent of the county. About 35 percent of the association is Nodaway soils, about 20 percent is Colo soils, and about 45 percent is soils of minor extent.

Nodaway soils are moderately well drained, and Colo soils are poorly drained. Nodaway soils and Colo soils are nearly level or gently sloping.

Typically, the surface layer of the Nodaway soils is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of about 60 inches is stratified dark grayish brown, brown, and grayish brown silt loam.

Typically, the surface layer of the Colo soils is very dark gray silty clay loam about 7 inches thick. The subsurface layer is black and very dark gray silty clay loam about 35 inches thick. The next layer is very dark gray silty clay loam about 10 inches thick. The substratum to a depth of about 60 inches is very dark gray and dark gray silty clay loam.

The minor soils in this association are numerous, and most of them formed in recent alluvium. The most extensive of the minor soils are the Coppock, Klum, Lawson, Okaw, and Richwood soils. The Coppock soils are somewhat poorly drained or poorly drained. Lawson soils are somewhat poorly drained. The loamy Klum soils are moderately well drained. Perks soils are excessively drained. The poorly drained, very slowly permeable Okaw soils are on low stream terraces. Richwood soils are well drained.

The soils in this association are used mainly for cultivated crops. Permanent pastures are confined to the more frequently flooded areas. In some of the more frequently flooded areas, the soils are used as woodland and habitat for wildlife.

In about 60 percent of the areas, the soils are well suited to row crops. In the rest of the areas, the soils are mostly moderately suited. The main enterprises are growing corn and soybeans for cash crops and raising and feeding hogs and beef cattle. The main concerns in management are controlling flooding, controlling runoff from the uplands, controlling the seasonal high water table, and maintaining tilth and fertility.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Weller silt loam, 2 to 5 percent slopes, is one of several phases in the Weller series.

Some map units are made up of two or more major soils. These map units are called soil complexes.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Nodaway-Cantril complex, 2 to 5 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, sand and gravel, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

13B—Vesser-Colo complex, 2 to 5 percent slopes. This complex consists of gently sloping soils along narrow drainageways and on narrow foot slopes that are subject to flooding. It is about 55 percent Vesser silt loam and 30 percent Colo silty clay loam. The somewhat poorly drained or poorly drained Vesser soil is on the upper part of slopes, and the poorly drained Colo soil is on the lower part. Areas of this complex are long and narrow and range from 10 to 30 acres or more. The individual areas of the Vesser and Colo soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Vesser soil is very dark gray silt loam about 10 inches thick. The subsurface layer is very dark gray and dark gray silt loam about 20 inches thick. The subsoil is more than 30 inches thick. The upper part is gray, mottled, friable silty clay loam, and the lower part is grayish brown, mottled, firm silty clay loam. In places the very dark gray surface layer and subsurface layer are less than 10 inches thick.

Typically, the surface layer of the Colo soil is black silty clay loam about 10 inches thick. The subsurface layer is black silty clay loam in the upper part and very dark gray silty clay loam in the lower part. It is about 36 inches thick. The substratum to a depth of 60 inches or more is dark gray silty clay loam.

Included with this complex in mapping and making up about 15 percent of the unit are small areas of Nodaway and Tuskeego soils and soils with a silty clay subsoil. Tuskeego soils contain more clay in the subsoil and have less organic matter than the Vesser soil. Tuskeego

soils are near the adjacent upland side slopes. The moderately well drained Nodaway soils contain less clay and organic matter than the Colo soil. Nodaway soils are adjacent to the stream channel.

The permeability of the Vesser and Colo soils is moderate. The available water capacity of these soils is high, and runoff is slow or medium. These soils have a seasonal high water table. The shrink-swell potential of the Colo soil is high. Reaction in the surface layer of these soils is medium acid in unlimed areas, and reaction in the subsoil of the Vesser soil is medium acid. The organic matter content of the surface layer is 3 to 4 percent in the Vesser soil and 4 to 5 percent in the Colo soil. The subsoil of the Vesser soil is medium in available phosphorus and low in available potassium. The lower part of the deep subsurface layer of the Colo soil is medium in available phosphorus and very low in available potassium. The soils are easily tilled under optimum moisture conditions, but if the Colo soil is worked when wet, it is likely to become hard and cloddy when dry.

These soils are used mainly for row crops, hay, and pasture. They are well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. They are poorly suited to trees. Row crops can be grown much of the time on these soils if adequate drainage and flood protection can be provided. Tile drains function satisfactorily. In many places, diversion terraces may be needed.

Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIw.

23C—Arispe silty clay loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 40 acres or more.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsoil is about 39 inches thick. The upper part is very dark gray, friable silty clay loam; the middle part is dark grayish brown, mottled, firm silty clay loam; and the lower part is grayish brown, mottled, firm and friable silty clay loam. The substratum to a depth of 60 inches or more is grayish brown, mottled silty clay loam. In some places, there are moderately eroded areas where the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Clarinda soils on the lower part of the side slopes above the drainageways. The Clarinda soils are more poorly drained than the Arispe soil.

This Arispe soil has moderately slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. It is easily tilled under optimum moisture conditions, but if worked when wet it is likely to become hard and cloddy when dry. The subsoil is very low in available phosphorus and low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, erosion is a severe hazard. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, helps to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, erosion control practices, such as contouring and terracing, are effective, but in some places, these practices are not effective because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIIe.

23C2—Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 20 to 50 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of dark grayish brown subsoil material into the surface layer. The subsoil is about 38 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is light olive gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches or

more is light olive gray, mottled silty clay loam. In some places, there are severely eroded areas where the surface layer is mostly dark grayish brown silty clay loam. In other places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the unit are small areas of Clarinda soils on the lower part of the side slopes above the drainageways. Clarinda soils are more poorly drained than the Arispe soil.

This Arispe soil has moderately slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is easily tilled under optimum moisture conditions, but if worked when wet, it is likely to become hard and cloddy when dry. The subsoil is very low in available phosphorus and low in available potassium.

This Arispe soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, erosion is a severe hazard. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, helps to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are effective, but in some places, these practices are difficult to set up because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. This soil generally needs more nitrogen than the less eroded Arispe soil, and it requires more production input to maintain high yields and to maintain or improve tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIIe.

41B—Sparta loamy fine sand, 2 to 5 percent slopes. This gently sloping, excessively drained soil is on stream terraces. Areas are irregular in shape and range from 5 to 10 acres or more.

Typically, the surface layer is very dark grayish brown loamy fine sand about 8 inches thick. The subsurface layer, about 5 inches thick, is also very dark grayish brown loamy fine sand. The subsoil is brown, very friable loamy fine sand about 26 inches thick. The substratum to a depth of 60 inches or more is yellowish brown fine sand. In places, slopes are less than 2 percent.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Dickinson soils. Dickinson soils have a higher available water capacity than the Sparta soil. Dickinson soils are on the less sloping part of the map unit.

This Sparta soil has rapid permeability. The available water capacity is low, and runoff is slow. The reaction in the surface layer is medium acid in unlimed areas, and the reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. It is very friable and easily tilled, and it warms early in the spring and can be worked soon after rains. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to poorly suited to corn, soybeans, and small grains. It is moderately suited to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, and farming on the contour can be used on these droughty soils to help conserve moisture and control erosion. Plowing these soils in the fall subjects them to wind erosion. The hazard of wind erosion can be reduced by leaving a rough plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Pasture management on this droughty soil is difficult. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, but most trees are in groves and around farmsteads. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is IVs.

51—Vesser silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained or poorly drained soil is on the higher areas of the flood plain, foot slopes, and alluvial fans. It is subject to flooding. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is about 23 inches thick. It is very dark gray and very dark grayish brown silt loam in the upper part and dark grayish brown and grayish brown silt loam in the lower part. The subsoil is more than 28 inches thick. The upper part is very dark grayish brown and dark gray, firm silty clay loam, and the lower part is grayish brown, mottled, firm silty clay loam. In some small areas the very dark gray surface layer and subsurface layer are less than 10 inches thick, and in other small areas the texture of the surface layer is silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of soils that have a silty clay subsoil and that occur throughout the map unit. These soils are more difficult to drain than the Vesser soil.

This Vesser soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains about 3 to 4 percent organic matter. It is friable and easily tilled under optimum moisture conditions, but it tends to warm and dry more slowly in spring than soils with less clay in the subsoil. The subsoil is medium in available phosphorus and low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage and protection against runoff from higher areas can be provided. Tile drains function satisfactorily on this soil if suitable outlets are obtained. In many places, diversion terraces on adjacent foot slopes can be used.

When this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is IIw.

56B—Cantril loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on slightly concave to plane foot slopes on uplands. The areas are long and narrow and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is about 38 inches thick. The upper part is dark grayish brown and yellowish brown, friable loam; the middle part is grayish brown and yellowish brown, mottled, friable clay loam; and the lower part is grayish brown and brown, mottled, friable clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown, mottled clay loam. In some small areas the very dark grayish brown surface layer and subsurface layer are more than 10 inches thick. In other small areas the surface layer is grayish brown loam overwash up to 8 inches thick.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Coppock soils on the lower part of foot slopes. Coppock soils contain more silt and less sand than the Cantril soil.

This Cantril soil has moderate permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction of the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and available potassium.

This soil is mainly used for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is moderately suited to trees. This soil receives excess runoff from adjacent slopes. In many places, diversion terraces can be used for protection against runoff from higher areas. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places this soil is suited to erosion control practices, such as contouring and terracing. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of organic material increases fertility and helps to maintain tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

58E—Douds loam, 14 to 18 percent slopes. This moderately steep, moderately well drained soil is on high stream benches along the major streams and rivers in the county. The areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsurface layer is dark grayish brown and brown loam about 6 inches thick. The subsoil is about 42 inches thick. The upper part is brown, friable loam; the middle part is strong brown and brown,

friable clay loam grading with depth to strong brown, friable sandy clay loam; and the lower part is strong brown, mottled, very friable loamy sand and friable loam and sandy loam. The substratum to a depth of 60 inches or more is strong brown, mottled loamy sand and sandy loam. In some moderately eroded areas some of the subsoil is mixed into the surface layer. In other small areas the surface layer is 6 to 10 inches thick. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Clinton and Galland soils. Clinton soils are on the upper part of the side slopes, and Galland soils are on the lower part. Clinton soils contain more clay and silt and less sand than the Douds soil, and Galland soils contain more clay in the subsoil.

This Douds soil has moderate permeability. The available water capacity is moderate, and runoff is rapid. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 or 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, hay, and woodland. It is generally not suited to corn, soybeans, and small grains. It is moderately suited to trees and grasses and legumes for hay and pasture.

This soil is very highly susceptible to erosion, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. In some areas, the soil is suitable for improved pasture. Permanent pasture can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Because this soil is moderately steep, the operation of farm machinery can be both difficult and dangerous.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of the slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Survival of seedlings should not be a problem.

The land capability classification is VIe.

58F—Douds loam, 18 to 40 percent slopes. This steep and very steep, moderately well drained soil is on high stream benches along major streams and rivers in the county. The areas of this soil are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is about 38 inches thick. The upper part is brown, friable loam; the middle part is brown and strong brown, mottled, friable loam; and the lower part is strong brown, mottled, friable sandy clay loam. The substratum to a depth of 60 inches or more is grayish brown and yellowish brown, mottled loam. In some severely eroded areas the surface layer is mostly brown loam. In some places the subsoil is not so thick and the substratum is stratified with sandy loam, loamy sand, and sand.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are areas of Galland soils. Galland soils contain more clay in the subsoil than the Douds soil.

This Douds soil has moderate permeability. The available water capacity is moderate, and runoff is very rapid. This soil has a seasonal high water table. Reaction in the surface layer is medium acid, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly as woodland, pasture, and habitat for wildlife. This soil is not suited to cultivated crops. It is poorly suited to hay and pasture. It is moderately suited to trees. It is moderately suited or well suited to use as habitat for openland wildlife and woodland wildlife.

This soil is very highly susceptible to erosion, and it is not suitable for row crops. It is poorly suited to grasses and legumes for pasture; however, the use of this soil for pasture is effective in controlling erosion. Pasture management on this soil is difficult. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition. The use of ordinary farm machinery is both difficult and dangerous on the steep and very steep slopes.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Trees grow best on the lower part of northerly and easterly slopes and in coves. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. In areas where erosion occurs, planted seedlings do not survive well unless they are planted closely together to achieve the desired stand density. Because of the steepness of the slope, the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution.

The land capability classification is VIIe.

65E—Lindley loam, 14 to 18 percent slopes. This moderately steep, well drained soil is on convex, narrow ridgetops, nose slopes, and side slopes in the uplands.

The areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil, about 36 inches thick, is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some moderately eroded areas, the subsoil has been mixed into the surface layer. In other small areas, the surface layer is 6 to 8 inches thick. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Douds and Keswick soils. The Douds soils are on the lower part of the side slopes, and the Keswick soils are on the upper part. The Douds soils are more stratified than the Lindley soil, and the Keswick soils are seepy during wet periods and contain more clay in the subsoil.

This Lindley soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains about 1 or 2 percent organic matter. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, and woodland. It is generally not suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture.

Because it is moderately steep, this soil is very highly susceptible to erosion, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. In some areas the soil is suitable for improved pasture. Using farm machinery on this soil can be both difficult and dangerous. Permanent pasture can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of the slope, the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Survival of seedlings should not be a problem.

The land capability classification is VIe.

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained soil is on convex, narrow ridgetops, nose slopes, and side slopes in the uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown subsoil material into the surface layer. The subsoil, about 38 inches thick, is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some severely eroded areas, the surface layer is mostly yellowish brown clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Douds and Keswick soils. The Douds soils are on the lower part of side slopes, and the Keswick soils are on the upper part. The Douds soils are more stratified than the Lindley soil, and the Keswick soils are seepy during wet periods and contain more clay in the subsoil.

This Lindley soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture and hay. It is generally not suited to corn, soybeans, and small grains, and it is moderately suited to poorly suited to grasses and legumes for hay and pasture. This soil is moderately suited to trees.

This moderately steep soil is very highly susceptible to further erosion damage, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. Improved pasture is suitable in some areas on this moderately steep soil. Permanent pastures can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition. The operation of farm machinery can be both difficult and dangerous.

This soil is moderately suited to trees. Hardwood seedlings, however, require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods to eroded or formerly cultivated soils. If areas of this soil are planted to trees, the hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of slope, the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Planted seedlings do not survive

well unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is Vle.

65F—Lindley loam, 18 to 25 percent slopes. This steep, well drained soil is on convex, narrow nose slopes and on side slopes of valleys in the uplands. The areas are elongated, narrow, and irregular in shape and range from 20 to 100 acres or more.

Typically, the surface layer is very dark gray loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 6 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable clay loam, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown loam. In some moderately eroded areas some of the subsoil is mixed into the surface layer, and in some severely eroded areas the surface layer is mostly yellowish brown clay loam. In other small areas the surface layer is very dark gray loam about 6 to 8 inches thick.

ncluded with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Douds and Keswick soils. The Douds soils are on the lower part of side slopes, and the Keswick soils are on the upper part. The Douds soils are more stratified than the Lindley soil, and the Keswick soils are seepy during wet periods and contain more clay in the subsoil.

This Lindley soil has moderately slow permeability. The available water capacity is high, and runoff is very rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 2.0 percent organic matter. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, woodland, and wildlife habitat. It is not suited to cultivated crops. This soil is poorly suited to hay and pasture and moderately suited to trees. It is moderately suited or well suited to openland wildlife habitat and woodland wildlife habitat.

This steep soil is very highly susceptible to erosion. It is not suitable for row crops. This soil is poorly suited to grasses and legumes for pasture; however, the use of this soil for pasture is effective in controlling erosion. Pasture management on this soil is difficult. Overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition. On these steep slopes the use of ordinary farm machinery is both difficult and dangerous.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Trees grow best on the lower part of northerly and easterly slopes and in coves. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. In areas where erosion occurs, planted seedlings do not survive well and, therefore, should be planted close together and thinned later to achieve the desired stand density. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution.

The land capability classification is VIIe.

65G—Lindley loam, 25 to 40 percent slopes. This very steep, well drained soil is on side slopes of valleys in the uplands. The areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is dark grayish brown loam about 4 inches thick. The subsoil is about 35 inches thick. The upper part is brown, friable clay loam, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled loam. In some moderately eroded areas, some of the subsoil is mixed into the surface layer, and in some severely eroded areas the surface layer is mostly brown clay loam. In other small areas the very dark grayish brown surface layer is 6 to 8 inches thick.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Keswick and Nordness soils. The Keswick soils are on the upper part of side slopes, and the Nordness soils are on the lower part. The Keswick soils are seepy during wet periods and contain more clay in the subsoil than the Lindley soil. The Nordness soils are no more than 20 inches deep to limestone bedrock.

This Lindley soil has moderately slow permeability. The available water capacity is high, and runoff is very rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The loam surface layer contains about 0.5 to 2.0 percent organic matter. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, woodland, and wildlife habitat. It is not suited to cultivated crops. It is poorly suited to hay and pasture and moderately suited to trees. It is moderately suited or well suited to openland wildlife habitat and woodland wildlife habitat.

This very steep soil is very highly susceptible to erosion, and it is not suitable for row crops. This soil is poorly suited to grasses and legumes for pasture; however, the use of this soil for pasture is effective in controlling erosion. Pasture management on this very steep soil is difficult. Overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in

good condition. The use of ordinary farm machinery is both difficult and dangerous on these very steep slopes.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Trees grow best on the lower part of northerly and easterly slopes and in coves. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. In areas where erosion occurs, planted seedlings do not survive well and should, therefore, be planted close together and thinned later to achieve the desired stand density. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution.

The land capability classification is VIIe.

75—Givin silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on narrow to moderately wide, convex ridgetops in the loess-covered uplands. The areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 41 inches thick. The upper part is brown, mottled, friable silty clay loam; the middle part is dark grayish brown and grayish brown, mottled, firm silty clay loam and silty clay; and the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is grayish brown, mottled silty clay loam. In places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of moderately well drained Ladoga soils on the narrow, convex ridgetops.

This Givin soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time on this soil. Drainage generally is adequate on this somewhat poorly drained soil, but in wet years tile drains permit more timely field operations in some of the lower areas.

This soil is used mostly for crops, but in places it is used for pasture or hay. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

This soil is moderately suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is I.

75B—Givin silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to narrow to moderately broad flats. It is on narrow to moderately wide, convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is dark grayish brown silt loam. The subsoil is about 38 inches thick. The upper part is dark grayish brown and brown, friable silty clay loam; the middle part is dark grayish brown and light brownish gray, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of moderately well drained Ladoga soils on the narrow, convex ridgetops.

This Givin soil has moderately slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain better tilth, and increases water infiltation.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff,

and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problem in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

76B—Ladoga silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled, silty clay loam. In places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Givin soils that are on the less sloping part of this unit and are more poorly drained than the Ladoga soil.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, trees, and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult to set up because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet, however, causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

76C—Ladoga silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is brown, friable silty clay loam; the middle part is brown and dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silty clay loam. In small, moderately eroded areas some of the subsoil is mixed into the surface layer. In places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Hedrick soils that are at the head of drainageways. Hedrick soils contain less clay in the subsoil than the Ladoga soil and have a grayer subsoil.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains about 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult to set up because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or

the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

76C2—Ladoga silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 36 inches thick. The upper part is brown, firm silty clay loam; the middle part is brown and dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silt loam. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Hedrick soils that are at the head of drainageways. Hedrick soils contain less clay in the subsoil than the Ladoga soil and have a grayer subsoil.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Ladoga soil and requires greater production input to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problem in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

76D2—Ladoga silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 37 inches thick. The upper part is brown, firm silty clay loam, and the lower part is yellowish brown and grayish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silt loam. In some small, severely eroded areas the surface layer is mainly brown silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Rinda soils. The Rinda soils are on the lower part of side slopes and are more poorly drained and grayer than the Ladoga soil. Rinda soils are seepy during wet periods.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and

small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a very severe hazard. Row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult to establish because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Ladoga soil and requires greater production input to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

80B—Clinton silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 10 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is dark grayish brown and brown silt loam about 12 inches thick. The subsoil is more than 46 inches thick. The upper part is dark yellowish brown and yellowish brown, friable silty clay loam; the middle part is dark yellowish brown and yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm and friable silty clay loam. In some small moderately eroded areas some of the subsoil is mixed into the surface layer. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Keomah soils on the less sloping part of the map unit. The Keomah soils are more poorly drained than the Clinton soil.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. This surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. Row crops can be grown much of the time on this soil, but erosion is a moderate hazard. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult to establish because of the undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as it dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIe.

80C—Clinton silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is about 41 inches thick. The upper part is brown, friable silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silty clay loam. In some small, moderately

eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Both soils contain more clay in the subsoil and are seepy during wet periods.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, pasture, and woodland. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material helps to maintain tilth, increase fertility, and increase water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

80C2—Clinton silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 37 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silty clay loam. In some small, severely eroded areas the surface layer is mostly brown silty clay loam.

Included with this soil in mapping and making up about 5 to 10 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Ashgrove and Keswick soils contain more clay in the subsoil and are seepy during wet periods. Also included are small areas of a well drained, moderately permeable soil that contains less clay in the subsoil and drains better than the Clinton soil.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mostly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Clinton soil and

requires greater production inputs to maintain high yields and to maintain or improve soil tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Hardwood seedlings require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods on eroded or formerly cultivated soils.

The land capability classification is IIIe.

80D—Clinton silt loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 4 to 30 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown, firm silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Both Ashgrove and Keswick soils contain more clay in the subsoil and are seepy during wet periods.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, pasture, and woodland. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a very severe hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

80D2—Clinton silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 4 to 30 acres or more.

Typically, the surface layer is brown silt loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of dark yellowish brown silty clay loam subsoil material into the surface layer. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown silty clay loam. In some small, severely eroded areas the surface layer is mostly dark yellowish brown silty clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Both Ashgrove and Keswick soils contain more clay in the subsoil and are seepy during wet periods.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer is 0.5 to 1.5 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a very severe hazard of erosion. Row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material helps to maintain tilth, increases fertility, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Clinton soil and requires greater production inputs to maintain high yields and to maintain or improve soil tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is well suited to trees. Hardwood seedlings require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods on eroded or formerly cultivated soils.

The land capability classification is IIIe.

88—Nevin silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low stream terraces and rarely floods. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer, about 9 inches thick, is very dark gray and black silty clay loam. The subsoil is about 34 inches thick. The upper part is very dark grayish brown and dark grayish brown, friable silty clay loam; and the lower part is dark grayish brown and grayish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is grayish brown, mottled silt loam. In places, the soil is poorly drained with a grayer subsoil. In other places, the surface layer and subsoil are silt loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Colo and Richwood soils. Colo soils are in shallow depressions and along drainageways, and Richwood soils are on the highest part of the map unit. Colo soils are more poorly drained and Richwood soils are better drained than the Nevin soil.

This Nevin soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3.5 to 4.5 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and high in available potassium.

This soil is used mostly for cultivated crops. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time. Drainage is adequate on this somewhat poorly drained soil, but in wet years tile drains can be beneficial for timely field operations in some areas that are on low positions on the landscape.

This land is seldom used for pasture or hay, because it is used mostly for crops. However, when this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is I.

110B—Lamont fine sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on stream terraces. The areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsurface layer is brown fine sandy loam about 5 inches thick. The subsoil is more than 47 inches thick. It is dark yellowish brown and yellowish brown, very friable fine sandy loam in the upper part; and loose yellowish brown loamy fine sand with a few 1/2- to 1-inch bands of brown and yellowish brown, very friable fine sandy loam in the lower part. In places, the surface layer is loamy fine sand, and these areas are more droughty. In other places, the slope is less than 2 percent.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Ainsworth and Chelsea soils. Ainsworth soils have more clay and silt and less sand than the Lamont soil, and they have more available moisture. Chelsea soils have more sand and less clay, have less available moisture, and are more droughty.

This Lamont soil has moderately rapid permeability. The available water capacity is moderate, and runoff is medium. Reaction in the surface layer is medium acid in

unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 0.5 to 1.0 percent organic matter. It is very friable and is easily tilled. It warms early in the spring and can be worked soon after rains. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, erosion is a moderate hazard. This soil is also droughty. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, and farming on the contour can be used to help conserve moisture and control erosion. Plowing in the fall subjects the soil to wind erosion. The hazard of wind erosion can be reduced by leaving a rough plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

110C—Lamont fine sandy loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on stream terraces. The areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is brown fine sandy loam about 8 inches thick. The subsurface layer is very dark brown fine sandy loam about 4 inches thick. The subsoil, about 28 inches thick, is brown, very friable fine sandy loam in the upper part; and dark yellowish brown, very friable fine sandy loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand. In places, the surface layer is loamy fine sand, and these areas are more droughty.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Ainsworth and Chelsea soils. Ainsworth soils have more clay and silt and less sand than the Lamont soil, and they also have more available moisture. Chelsea soils have more sand and less clay, have less available moisture, and are more droughty.

This Lamont soil has moderately rapid permeability. The available water capacity is moderate, and runoff is medium. The reaction in the surface layer is medium acid in unlimed areas, and the reaction in the subsoil is medium acid. The surface layer contains 0.5 to 1.0 percent organic matter. It is very friable and easily tilled, and it warms early in spring and can be worked soon after rains. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, erosion is a severe hazard. This soil is also droughty. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, and farming on the contour can be used to help conserve moisture and control erosion. Plowing in the fall subjects the soil to wind erosion. The hazard of wind erosion can be reduced by leaving a rough plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

122—Sperry silt loam, 0 to 1 percent slopes. This level, very poorly drained or poorly drained soil is in slight depressions on broad flats on loess-covered upland divides. This soil is subject to ponding. The areas are irregular in shape and range from 4 to 10 acres or more.

Typically, the surface layer is very dark gray silt loam about 11 inches thick. The subsurface layer is dark gray silt loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is dark gray, mottled, very firm silty clay; the middle part is gray, mottled, very firm silty clay; and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled silty clay loam. In some places, the surface layer is silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Taintor soils that are in the higher areas between the

depressions. Taintor soils have more clay in the surface layer than the Sperry soil and are easier to drain.

This Sperry soil has slow permeability. The available water capacity is high, and runoff is very slow or ponded. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. It is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is moderately suited to corn, soybeans, and small grains, and it is moderately suited to well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage can be provided. Tile drains generally are not satisfactory on this soil, but in places surface drains can be used to remove excess water. This soil warms slowly in spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. This soil is fairly difficult to manage and requires timely farming operations. An occasional year of meadow improves tilth and helps to control weeds and insects. If the soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction, and results in poor tilth.

The land capability classification is IIIw.

130—Belinda silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow to moderately broad flats on loess-covered upland divides. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is dark gray silt loam grading with depth to grayish brown silt loam. It is about 9 inches thick. The subsoil is more than 42 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is olive gray and light olive gray, mottled, firm silty clay loam. In some small areas the very dark gray surface layer is about 10 to 12 inches thick or less than 6 inches thick. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Pershing soils in the more sloping areas. Pershing soils are better drained than the Belinda soil.

This Belinda soil has very slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is moderately suited to well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage can be provided, but tile drains generally are not very satisfactory on this very slowly permeable soil. Open ditches, surface drainage, landshaping, and bedding are all used to remove surface water. This soil warms slowly in the spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. Because this soil is fairly difficult to manage, farming operations need to be timely. An occasional year of meadow improves tilth and helps control weeds and insects. If used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. If areas of this poorly drained soil are planted to trees, the use of equipment will need to be restricted to drier times of the year or to winter when the ground is frozen. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIw.

131B—Pershing silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained or moderately well drained soil is adjacent to narrow to moderately broad flats. It is on convex ridgetops and convex side slopes bordering nearly level, stable interstream divides in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is more than 48 inches thick. The upper part is yellowish brown and dark grayish brown, friable silty clay loam; the middle part is dark grayish brown and grayish brown, very firm silty clay; and the lower part is grayish brown and light brownish gray, firm silty clay loam grading with depth to friable silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Belinda

soils that are in the less sloping areas and are more poorly drained than the Pershing soil.

This Pershing soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIe.

131C—Pershing silt loam, 5 to 9 percent slopes. This moderately sloping, somewhat poorly drained or moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 10 to 60 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper part is dark grayish brown and yellowish brown, firm silty clay loam; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong and Rinda soils on the lower part of side slopes. During wet periods, seepy areas are in the Armstrong and Rinda soils.

This Pershing soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for hay, pasture, and cultivated crops. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a severe hazard. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult to establish because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIe.

132B—Weller silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is more than 48 inches thick. The upper part is yellowish brown, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm and friable silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Beckwith soils on the less sloping part of the map unit. Beckwith soils are more poorly drained than the Weller soil.

This Weller soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, cultivated crops, and woodland (fig. 10). It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a severe hazard. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIe.

132C—Weller silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. The areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, firm silty clay loam with grayish coatings on peds; the middle part is yellowish brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Ashgrove soils are grayer and have more clay than the Weller soil, and Keswick soils have more sand. Seepy areas occur in the Ashgrove and Keswick soils during wet periods.

This Weller soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, cultivated crops, and woodland. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, erosion is a severe hazard.

Figure 10.—Weller silt loam, 2 to 5 percent slopes, is suited to alfalfa hay.

Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIe.

133—Colo silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on the flood plain and is subject to flooding. Areas are long and narrow or

irregular in shape and range from 10 to 40 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 7 inches thick. The subsurface layer, about 35 inches thick, is black and very dark gray silty clay loam. The next layer is very dark gray silty clay loam about 10 inches thick. The substratum to a depth of 60 inches or more is very dark gray and dark gray silty clay loam. In some places, the subsurface layer extends to a depth of 30 inches.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of soils that have a silty clay subsoil. These areas are in shallow depressions and along drainageways and are more difficult to drain than the Colo soil.

This Colo soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is neutral, and reaction in the thick subsurface layer is neutral. The lower part of this subsurface layer is medium in available phosphorus and very low in available potassium. The surface layer contains 4 to 5 percent organic matter. It is easily tilled under optimum moisture conditions, but if worked when wet, it can become hard and cloddy when dry.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage and protection against runoff from higher areas can be provided. Drainage is needed to reduce wetness and to provide proper aeration and a deep root zone for plants. Tile drains function satisfactorily in this soil if suitable outlets are obtained. Flooding limits the use of tile drains in low lying areas. In many places, diversion terraces are needed for protection against runoff from higher areas.

Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIw.

133B—Colo silty clay loam, 2 to 5 percent slopes. This gently sloping, poorly drained soil is along narrow drainageways. This soil receives runoff from higher areas and is subject to flooding. Areas are long and narrow and range from 10 to 30 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer, extending to a depth of about 52 inches, is very dark gray silty clay loam in the upper part and black silty clay loam in the lower part. The substratum to a depth of 60 inches or more is dark gray silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of soils that have a silty clay subsoil. These soils are more difficult to drain than the Colo soil, and they occupy the lowest part of the slopes and are along drainageways. In some areas of urban construction, the soil has been disturbed by excavation or up to 3 feet of material has been added.

This Colo soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is neutral, and reaction in the thick subsurface layer is neutral. The lower part of this subsurface layer is medium in available phosphorus and very low in available potassium. The surface layer contains 4 to 5 percent organic matter. The surface layer is easily tilled under optimum moisture conditions, but if worked when wet, it can become hard and cloddy when dry.

This soil is used mainly for row crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage and protection against runoff from the higher areas can be provided. Tile drains function satisfactorily in this soil. In many places, diversion terraces may be needed for protection against runoff from the higher areas.

When this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIw.

133+—Colo silt loam, overwash, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom lands that are susceptible to flooding. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer, extending to a depth of about 46 inches, is black silty clay loam in the upper part and very dark gray silty clay loam in the lower part. The substratum to a depth of 60 inches or more is dark gray silty clay loam. In some places, the soil is stratified silty clay loam, and in other areas the upper part of the overwash layer is silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of soils that have a silty clay subsoil. These areas are in the lowest part of the unit and are more difficult to drain than the Colo soil.

This Colo soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is neutral, and reaction in the thick subsurface layer is neutral. The lower part of the subsurface layer is medium in available phosphorus and very low in available potassium. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay below the plow layer.

This soil is used mainly for pasture, hay, and cultivated crops. It is well suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage and flood protection can be provided. If suitable outlets are obtained, tile drains can function satisfactorily although adequate drainage is not feasible in the very low areas. In many places, diversion terraces are needed for flood protection against runoff from the higher areas.

Pasture management on this poorly drained soil is difficult. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIw.

154E—Ainsworth-Lamont complex, 9 to 18 percent slopes. This complex consists of strongly sloping and moderately steep, moderately well drained and well drained soils on low stream terrace escarpments. It is about 50 percent Ainsworth silt loam and 30 percent Lamont fine sandy loam. The moderately well drained Ainsworth soil is on the upper, less sloping part of the terrace escarpment, and the well drained Lamont soil is on the lower, more sloping part. Areas of this complex are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more. The areas of the Ainsworth soil and the areas of the Lamont soil are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Ainsworth soil is dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, mottled, friable silty clay loam; and the lower part is yellowish brown and grayish brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is brown sand.

Typically, the surface layer of the Lamont soil is brown fine sandy loam about 8 inches thick. The subsurface layer is brown fine sandy loam about 4 inches thick. The subsoil, about 26 inches thick, is dark yellowish brown and yellowish brown, very friable fine sandy loam. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand.

Included with this complex in mapping and making up about 20 percent of the map unit are areas of a soil that has stratified sands throughout the profile and is near the Lamont soil on the landscape and areas of a soil that has stratified loam, clay, and silty clay loam throughout the profile and is near the Ainsworth soil.

This Ainsworth soil has moderately slow permeability, and this Lamont soil has moderately rapid permeability. The available water capacity is high in the Ainsworth soil and moderate in the Lamont soil. Runoff is rapid. Reaction in the surface layer of these soils is medium acid in unlimed areas and reaction in the subsoil is medium acid or strongly acid. The surface layer of these soils contains 0.5 to 2.0 percent organic matter. The subsoil is medium in available phosphorus and low or very low in available potassium.

These soils are used mainly for pasture, hay, and woodland. They are poorly suited to corn, soybeans, and small grains except on the steeper slopes, where they are generally not suited to row crops. They are moderately suited to trees and to grasses and legumes for hay and pasture. These soils are very highly susceptible to erosion. The use of these soils for pasture or hay is effective in controlling erosion. Improved pasture is suitable in some areas, but because part of these soils are moderately steep, the operation of farm machinery may be both difficult and dangerous on the steeper slopes. Permanent pastures can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when these soils are wet causes surface compaction and increases runoff.

These soils are moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the moderately steep slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Survival of seedlings should not be a problem.

The land capability classification is VIe.

163B—Fayette silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 10 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsurface layer, about 4 inches thick, is brown silt loam. The subsoil, about 43 inches thick, is yellowish brown and dark yellowish brown, friable silty clay loam. The substratum to a depth

of 60 inches or more is yellowish brown, mottled silt loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Chelsea and Lamont soils on both the upper and lower parts of the slopes of this map unit. The Chelsea and Lamont soils are more droughty than the Fayette soil.

This Fayette soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil typically is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. Row crops can be grown much of the time on this soil, but erosion is a moderate hazard. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains. A crust forms as the surface dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

163C2—Fayette silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of dark yellowish brown silty clay loam subsoil material into the surface layer. The subsoil is about 37 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown silt loam. In some small, severely eroded areas, the surface layer is mostly dark yellowish brown silty clay loam. In other small, uneroded areas, the surface layer is dark grayish brown silt loam about 8 inches thick, and the subsurface layer is brown silt loam about 4 inches thick.

Included with this soil in mapping and making up about 5 to 15 percent of the map unit are small areas of Chelsea and Lamont soils on both the upper and lower parts of the slopes in this map unit. The Chelsea and Lamont soils are more droughty than the Fayette soil. Also included are small areas where the slopes are 10 to 12 percent.

This Fayette soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a severe hazard of erosion, but row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs

more nitrogen than the less eroded Fayette soil and requires greater production inputs to maintain high yields and to maintain or improve soil tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

173—Hoopeston fine sandy loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low stream terraces. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark brown fine sandy loam about 9 inches thick. The subsurface layer, extending to a depth of about 17 inches, is very dark grayish brown fine sandy loam. The subsoil is dark grayish brown and brown, mottled, very friable fine sandy loam about 10 inches thick. The substratum to a depth of 60 inches or more is pale brown and grayish brown, mottled loamy fine sand and fine sand. In some places, the texture of the subsoil is loamy sand or loam. In places the slopes are between 2 and 3 percent.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Dickinson and Sparta soils that are better drained than the Hoopeston soil. Dickinson and Sparta soils are on the higher part of the unit.

The permeability of this Hoopeston soil is moderately rapid in the subsoil and rapid in the substratum. The available water capacity is moderate, and runoff is slow. This soil has a seasonal high water table. The reaction in the surface layer is medium acid in unlimed areas, and the reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is very friable and very easily tilled. The surface layer warms early in spring and can be worked soon after rains. The subsoil is very low in available phosphorus and available potassium.

This soil is used mostly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time. Drainage is adequate, but the available water capacity is only moderate. Conservation tillage can be used to help conserve moisture in dry years. An occasional year of meadow improves tilth and helps to control weeds and insects. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. Plowing this soil in fall can subject it to wind erosion. The hazard of wind erosion can be reduced by leaving a roughened, plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface and helps to conserve moisture.

Pasture management on this droughty soil can be difficult. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, and timely deferment of grazing, especially during dry periods, are essential to keep the pasture and soil in good condition.

The land capability classification is IIs.

175—Dickinson fine sandy loam, 0 to 2 percent slopes. This nearly level, well drained and somewhat excessively drained soil is on stream terraces. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark brown fine sandy loam about 10 inches thick. The subsurface layer is very dark brown fine sandy loam about 5 inches thick. The subsoil, about 30 inches thick, is dark brown, very friable fine sandy loam in the upper part; brown, very friable fine sandy loam in the middle part; and dark yellowish brown, very friable loamy fine sand in the lower part. The substratum to a depth of 60 inches or more is dark yellowish brown sand. In places the surface layer is loamy fine sand, and these areas are more droughty.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Hoopeston and Sparta soils. Also included are some areas with 3 to 5 percent slopes. The Hoopeston soils are on the less sloping part of this unit, and the Sparta soils are on the more sloping part. The Hoopeston soils are more poorly drained than the Dickinson soil, and the Sparta soils are more droughty.

This Dickinson soil has moderately rapid permeability in the upper part and rapid permeability in the lower part. The available water capacity is moderate, and runoff is slow. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. It is very friable and easily tilled, and it warms early in the spring and can be worked soon after rains. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a hazard of wind erosion. This soil is also droughty. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, can be used to conserve moisture and to help control wind erosion. Plowing these soils in the fall subjects them to further wind erosion, but this erosion can be reduced by

leaving a rough plowed surface and alternating plowed and unplowed strips. Chisel plowed areas, which leave crop residue on the surface, greatly reduce the wind erosion hazard during fall plowing. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of the soil for pasture or hay is also effective in controlling wind erosion. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIs.

179E—Gara loam, 14 to 18 percent slopes. This moderately steep, well drained or moderately well drained soil is on convex side slopes of valleys in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 40 acres or more.

Typically, the surface layer is very dark gray loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 39 inches thick. The upper part is yellowish brown, friable loam; the middle part is strong brown, friable and firm clay loam; and the lower part is strong brown and yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong and Rinda soils that are on the upper part of side slopes. The Armstrong and Rinda soils are seepy during wet periods. The Rinda soils are more poorly drained than the Gara soil, and both the Armstrong and Rinda soils have more clay in the subsoil.

This Gara soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. The subsoil is very low or low in available phosphorus and very low in available potassium.

This soil is used mainly for hay and pasture. It is generally not suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture.

This moderately steep soil is very highly susceptible to erosion, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. Improved pastures are suitable in some areas, but because this soil is moderately steep, the operation of farm machinery can be both difficult and dangerous. Overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Survival of seedlings should not be a problem.

The land capability classification is VIe.

179E2—Gara loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, well drained or moderately well drained soil is on convex side slopes of valleys in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is very dark grayish brown loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of dark yellowish brown subsoil material into the surface layer. The subsoil is about 43 inches thick. The upper part is dark yellowish brown, friable loam; the middle part is strong brown, firm clay loam; and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some small, severely eroded areas the surface layer is mostly dark yellowish brown clay loam. In other small areas, the Gara soil is not eroded and has a very dark grayish brown loam surface layer about 8 inches thick and a dark grayish brown loam subsurface layer about 4 inches thick.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong and Rinda soils that are on the upper part of side slopes. The Armstrong and Rinda soils are seepy during wet periods. The Rinda soils are more poorly drained than the Gara soil, and both the Armstrong and Rinda soils have more clay in the subsoil.

This Gara soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. The subsoil is very low or low in available phosphorus and very low in available potassium.

This soil is used mainly for hay and pasture. It is generally not suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture.

This moderately steep soil is very highly susceptible to erosion damage, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. Improved pasture is suitable in

some areas of this moderately steep soil, but the operation of farm machinery can be both difficult and dangerous. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Hardwood seedlings, however, apparently require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods on eroded or formerly cultivated soils. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of slope, the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution.

The land capability classification is VIe.

180—Keomah silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on moderately wide, convex ridgetops in the loess-covered uplands. Areas are irregular in shape and range from 5 to 25 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown silt loam about 7 inches thick. The subsoil is more than 45 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the middle part is dark yellowish brown and grayish brown, mottled, firm silty clay loam; and the lower part is olive gray, mottled, friable silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of moderately well drained Clinton soils and a poorly drained soil with a grayer subsoil. Clinton soils are on the more sloping part of the map unit, and the poorly drained soil is in the center of the unit.

This Keomah soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas; and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time if adequate drainage is provided. Drainage is needed to reduce wetness and permit more timely field operations. Tile drains function satisfactorily on this soil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as it dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIw.

180B—Keomah silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to moderately broad flats on narrow to moderately wide, convex ridgetops and the upper part of side slopes. It is in the loess-covered uplands. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 6 inches thick, is grayish brown silt loam. The subsoil is about 40 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the middle part is dark yellowish brown and grayish brown, mottled, firm silty clay loam; and the lower part is grayish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of moderately well drained Clinton soils on the more sloping part of the unit.

This Keomah soil has moderately slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas; and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains. It is well suited to grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time, but there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year,

is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as it dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problem in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

192D2—Adair loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on convex, narrow ridgetops, nose slopes, and side slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is very dark grayish brown loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown clay loam subsoil material into the surface layer. The subsoil is more than 52 inches thick. The upper part is brown, friable clay loam; the middle part is brown, very firm clay with common yellowish red mottles; and the lower part is brown, mottled, firm clay loam grading with depth to yellowish brown and strong brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly brown clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Clarinda soils. Clarinda soils are on the upper part of side slopes and are more poorly drained than the Adair soil.

This Adair soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and is seepy in some areas during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. The subsoil is very low in available phosphorus and very low or low in available potassium.

This soil is used mainly for hay, row crops, and pasture. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture. The tillage of row crops creates a very severe hazard of erosion. Row crops can be grown some of the time if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all can reduce erosion. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this seepy soil can be difficult in spring and early summer. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IVe.

208—Klum fine sandy loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on the flood plain and is subject to flooding. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The substratum to a depth of 60 inches or more is stratified dark brown and brown fine sandy loam in the upper part; brown and dark brown loamy fine sand in the middle part; and brown and dark grayish brown sandy loam in the lower part.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Nodaway and Perks soils occurring throughout the map unit. Nodaway soils are more poorly drained than the Klum soil, and Perks soils are better drained.

This Klum soil has moderately rapid permeability. The available water capacity is low, and runoff is slow. This soil has a seasonal high water table. The reaction in the surface layer and the subsoil is neutral. The surface layer contains 0.5 to 1.5 percent organic matter. It is very friable and very easily tilled. The surface layer warms early in spring and can be worked soon after

rains. The substratum is very low in available phosphorus and available potassium.

This soil is used mostly for row crops, hay, and pasture.

This soil is moderately suited to corn, soybeans, and small grains. It is well suited to trees and grasses and legumes for hay and pasture. Row crops can be grown much of the time. This soil is subject to flooding in spring, and it is somewhat droughty in summer. The drainage is adequate, but the available water capacity is low. Conservation tillage can help to conserve moisture. An occasional year of meadow improves tilth and helps to control weeds and insects. Plowing this soil in the fall subjects it to wind erosion, but the erosion can be reduced by leaving a roughened, plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface and helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

Pasture management can be difficult on this soil that floods or is somewhat droughty. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, restricted use during wet periods, proper stocking, pasture rotation, and timely deferment of grazing, especially during dry periods, help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIs.

211—Edina silt loam, 0 to 1 percent slopes. This level, poorly drained soil is on narrow to broad flats on the loess-covered upland divides. Areas are irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsurface layer, about 7 inches thick, is dark gray silt loam. The subsoil is about 31 inches thick. The upper part is very dark gray and dark gray, mottled, very firm silty clay; the middle part is olive gray, mottled, very firm silty clay; and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Haig soils on the relatively high positions between the shallow depressions. Haig soils have less clay in the upper part of the subsoil and are easier to drain than the Edina soil.

This Edina soil has very slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is slightly acid in unlimed areas; and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage can be provided, but tile drains generally are not satisfactory on this very slowly permeable soil. Open ditches, surface drainage, landshaping, and bedding are all used to remove surface water. This soil warms slowly in spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. This soil is difficult to manage and requires timely use of farming operations. An occasional year of meadow improves tilth and helps to control weeds and insects.

When this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIIw.

220—Nodaway silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on the flood plain and is subject to flooding. Areas are irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of 60 inches or more is stratified dark grayish brown, brown, and grayish brown silt loam. In some places, the texture of the surface layer is loam, silty clay loam, and sandy loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Colo and Klum soils throughout the map unit. Colo soils are more poorly drained than the Nodaway soil, and Klum soils are more droughty.

This Nodaway soil has moderate permeability. The available water capacity is very high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer and in the substratum is neutral. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The substratum is medium in available phosphorus and available potassium.

This soil is used mainly for row crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and to grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time if adequate flood protection can be

provided. In many places, diversion terraces are needed on adjacent foot slopes to protect this soil against runoff from higher areas. Returning crop residue to the soil and not tilling when the soil is wet help to maintain good tilth.

Pasture management can be difficult because this soil is subject to flooding. Permanent pasture can be improved by renovating and reseeding. Once the pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIw.

222C—Clarinda silty clay loam, 5 to 9 percent slopes. This moderately sloping, poorly drained soil is on short, convex side slopes, convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 7 inches thick. The subsurface layer, extending to a depth of about 11 inches, is very dark gray silty clay loam. The subsoil is more than 49 inches thick. The upper part is dark gray, mottled, very firm silty clay; the middle part is dark gray, mottled, very firm clay; and the lower part is gray, mottled, very firm clay. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Adair and Colo soils. Adair soils are on the lower part of the side slopes, and Colo soils are along drainageways below the side slopes. Adair soils are better drained than the Clarinda soil, and Colo soils are easier to drain.

This Clarinda soil has very slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table and is very seepy in some areas during wet periods. The shrink-swell potential is high. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. It is generally difficult to till except under very optimum moisture conditions. If worked when wet, it can become very hard and cloddy when dry. The subsoil is low in available phosphorus and low or medium in available potassium.

This soil is used mainly for hay, pasture, and row crops. It is poorly suited to corn, soybeans, small grains, and trees, and it is moderately suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, wetness is a very serious problem and erosion is a severe hazard. In many places, a narrow, wet, seepy band on the upper part of the slope commonly remains wet until midsummer. This soil warms slowly in the spring and dries very slowly after rains. In wet years, planting is delayed. Tile drainage is not feasible on this very slowly permeable soil, but interceptor tile can be placed upslope in the adjacent soil. Row crops can be grown some of the time if adequate drainage and erosion protection are provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Pasture management on this wet and seepy soil is difficult particularly in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IVw.

222C2—Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, poorly drained soil is on short, convex side slopes, convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of dark gray silty clay subsoil material into the surface layer. The subsoil is more than 53 inches thick. The upper part is dark gray, mottled, very firm silty clay, and the lower part is gray, mottled, very firm clay. In some small, severely eroded areas the surface layer is mostly dark gray silty clay.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Adair and Colo soils. Adair soils are on the lower part of the side slopes, and Colo soils are along the narrow drainageways below the side slopes. Adair soils are better drained than the Clarinda soil, and Colo soils are easier to drain.

This Clarinda soil has very slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table and is very seepy in some areas during wet periods. The shrink-swell potential is high. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is generally difficult to till, except under very optimum moisture conditions. If worked when wet, it can become very hard and cloddy when dry. The subsoil is low in available phosphorus and low or medium in available potassium.

This soil is used mainly for hay, pasture, and row crops. It is poorly suited to corn, soybeans, small grains, and trees; and it is moderately suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, wetness is a severe limitation and erosion is a severe hazard. In many places, a narrow, wet, seepy band on the upper part of the slope remains wet until midsummer. This soil warms slowly in spring and dries very slowly after rains. In wet years, planting is delayed. Tile drainage is not feasible on this very slowly permeable soil, but interceptor tile can be placed upslope in the adjacent soil. Row crops can be grown some of the time if adequate drainage and erosion protection are provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Clarinda soil and requires more production inputs to maintain high yields and to maintain or improve soil tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this wet and seepy soil is difficult in spring and early summer. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IVw.

223C2—Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, poorly drained or somewhat poorly drained soil is on short, convex side slopes and nose slopes and in coves at the upper end of drainageways in the uplands. Areas are elongated, narrow, and irregular in shape and range from 4 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of dark grayish brown silty clay subsoil material into the surface layer. The subsoil is about 42 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is dark grayish brown, mottled, very firm clay; and the lower part is gray, mottled, very firm clay. The substratum to a depth of 60 inches or more is gray, mottled clay. In some small, severely eroded areas the surface layer is mostly dark grayish brown silty clay. In some small areas there is no subsoil material mixed into the uneroded surface layer. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Armstrong soils on the lower part of side slopes. Armstrong soils are better drained than the Rinda soil.

This Rinda soil has very slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table and is very seepy in some areas during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. It is generally difficult to till, except under very optimum moisture conditions. If worked when wet, it can become very hard and cloddy when dry. The subsoil is low in available phosphorus and low or medium in available potassium.

This soil is used mainly for hay, pasture, and row crops. It is poorly suited to corn, soybeans, small grains, and trees, and it is moderately suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, wetness is a severe limitation and erosion is a severe hazard. In many places, this soil has a narrow, wet, seepy band on the upper part of the slope, and it remains wet until midsummer. This soil warms slowly in spring and dries very slowly after rains. In wet years, planting is delayed. Tile drainage is not feasible on this very slowly permeable soil, but interceptor tile can be placed upslope in the adjacent soil. Row crops can be grown some of the time if adequate drainage and erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices such as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey

subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Rinda soil and requires greater production inputs to maintain high yields and to maintain or improve soil tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this wet and seepy soil is difficult especially in spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. If areas of this poorly drained soil are planted to trees, the use of equipment will need to be restricted to drier periods or during winter months when the ground is frozen. Special high flotation equipment may also be used for harvesting or management if it is necessary during wet periods. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IVw.

223D2—Rinda silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained or somewhat poorly drained soil is on short, convex side slopes, convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are elongated, narrow, and irregular in shape and range from 4 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of dark grayish brown silty clay subsoil material into the surface layer. The subsoil is more than 52 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is grayish brown, mottled, very firm clay; and the lower part is gray, mottled, very firm clay. In some small, severely eroded areas the surface layer is mostly dark grayish brown silty clay. In some small areas there is no subsoil material mixed into the uneroded surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong and Pershing soils. The Armstrong soils are on the lower part of the side slopes, and the Pershing soils are on the upper part. Armstrong and Pershing soils are better drained than the Rinda soil.

This Rinda soil has very slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and is very seepy in some areas during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it can become very hard and cloddy when dry. The subsoil is low in available phosphorus and low or medium in available potassium.

This soil is used mainly for pasture, hay, and row crops. It is poorly suited to corn, soybeans, small grains, and trees, and it is moderately suited to poorly suited to grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a very serious limitation of wetness and a very severe hazard of erosion. In many places, this soil has a narrow, wet, seepy band on the upper part of the side slope that remains wet until midsummer. This soil warms slowly in spring and dries very slowly after rains. In wet years, planting is delayed. Tile drainage is not feasible on this very slowly permeable soil, but interceptor tile can be placed upslope in the adjacent soil. Row crops can be grown some of the time if adequate erosion protection and drainage are provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all can reduce erosion. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Rinda soils and requires greater production inputs to maintain high yields and to maintain or improve soil tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this wet and seepy soil is difficult especially in spring and early summer. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. If areas of this poorly drained soil are planted to trees, the use of equipment will need to be restricted to drier periods or during winter months when the ground is frozen. Special high flotation equipment may also be used for harvesting or management if it is necessary during wet periods. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IVe.

260—Beckwith silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is in flat areas on ridgetops in the loess-covered uplands. Areas are irregular in shape and range from 4 to 10 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 7 inches thick, is light brownish gray silt loam. The subsoil is more than 45 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay, and the lower part is grayish brown, mottled, firm silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Weller soils on the more sloping part of the unit. Weller soils are better drained than the Beckwith soil.

This Beckwith soil has very slow permeability. The available water capacity is high, and runoff is slow or very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is very strongly acid in unlimed areas, and reaction in the subsoil is strongly acid. The silt loam surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown some of the time on this soil if adequate drainage can be provided, but tile drains generally are not very satisfactory on this very slowly permeable soil. Open ditches, surface drainage, land shaping, and bedding are all used to remove surface water. This soil warms slowly in the spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. This soil is fairly difficult to manage, and farming operations need to be timely. Intensive use for row crops causes the surface layer to puddle readily after rains. A crust forms as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. A very few small areas remain in native hardwoods. This soil is poorly drained, and the use of equipment will need to be restricted to drier periods or during winter months when the ground is frozen. Special high flotation equipment may also be used for harvesting or management if it is necessary during wet periods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIw.

263—Okaw silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low stream terraces and rarely floods. Areas are irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer, about 15 inches thick, is grayish brown and light brownish gray silt loam and silty clay loam. The subsoil is more than 38 inches thick. The upper part is grayish brown, mottled, friable silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray and olive gray, mottled, firm silty clay and silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Ainsworth soils occurring on the highest part of the map unit. Ainsworth soils are better drained than the Okaw soil.

This Okaw soil has very slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage can be

provided. Tile drains generally are not satisfactory on this very slowly permeable soil, and providing adequate outlets is a problem in areas where the soil is wide and at relatively low-lying elevations. Open ditches, surface drainage, land shaping, and bedding are all used to remove surface water. This soil warms slowly in spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. Because this soil is fairly difficult to manage, farming operations need to be timely. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil and avoiding tilling when the soil is wet helps maintain good tilth.

Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees, and a few small areas remain in native hardwoods. This soil is poorly drained, and the use of equipment will need to be restricted to drier periods or during winter months when the ground is frozen. Special high flotation equipment may also be used for harvesting or management if it is necessary during wet periods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIw.

263B—Okaw silt loam, 2 to 5 percent slopes. This gently sloping, poorly drained soil is on low stream terraces and rarely floods. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 14 inches thick, is grayish brown silt loam. The subsoil is more than 38 inches thick. The upper part is grayish brown, mottled, friable silty clay loam; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is olive gray, mottled, firm silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Ainsworth soils on the highest part of the map unit. Ainsworth soils are better drained than the Okaw soil.

This Okaw soil has very slow permeability. The water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil typically is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, pasture, and hay. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. If this soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown much of the time if adequate drainage and erosion protection are provided. Tile drains generally are not satisfactory on this very slowly permeable soil, and outlets are a problem in low areas. In many places, diversion terraces can be used for protection against runoff from the higher areas. In most places such erosion control practices as contouring and terracing are difficult because of short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. Avoiding tilling when the soil is wet, also helps maintain good tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. This soil is poorly drained, and the use of equipment will need to be restricted to drier periods or during the winter months when the ground is frozen. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIw.

264B—Ainsworth silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on low stream terraces. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, friable silty clay loam; and the lower part is yellowish brown and grayish brown, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown sand. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In other places the slope is less than 2 percent.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Lamont and Okaw soils. Lamont soils are on the more sloping part of the map unit, and Okaw soils are on the less sloping part. Lamont soils are more droughty than the Ainsworth soil, and Okaw soils are more poorly drained.

This Ainsworth soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is strongly acid. This surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, small grains, and trees and to grasses and legumes for hay and pasture. Row crops can be grown much of the time on this soil, but there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as it dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

264C2—Ainsworth silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on low stream terraces. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 41 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, friable silty clay loam; and the lower part is yellowish brown and grayish brown, friable silt loam. The substratum to a depth of 60 inches or more is yellowish brown sand. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some small, uneroded areas the surface layer is dark grayish brown silt loam about 8 inches thick, and the subsurface layer is brown silt loam about 4 inches thick.

Included with this soil in mapping and making up about 5 to 15 percent of the map unit are small areas of Lamont and Okaw soils. Lamont soils are on the more sloping part of the map unit, and Okaw soils are on the less sloping part. Lamont soils are more droughty than the Ainsworth soil, and Okaw soils are more poorly drained.

This Ainsworth soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a severe hazard of erosion damage, but row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form

a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

279—Taintor silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad flats in the loess-covered upland divides. Areas are irregular in shape and range from 20 to 100 acres or more.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer, about 9 inches thick, is black and very dark gray silty clay loam. The subsoil is about 30 inches thick. The upper part is dark gray, mottled, firm silty clay; the middle part is gray, mottled, firm silty clay; and the lower part is gray, mottled, firm and friable silty clay loam. The substratum to a depth of 60 inches or more is gray, mottled silt loam. In some small areas the texture of the surface layer is silt loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Kalona, Mahaska, and Sperry soils. Kalona soils are in flat areas in the center of moderately broad and broad flats. Mahaska soils are on the more sloping part of the unit, and Sperry soils are in shallow depressions. Kalona soils have more clay in the surface layer and are more difficult to till than the Taintor soil. Mahaska soils are better drained, Sperry soils are more slowly permeable and are more poorly drained, and Sperry soils are more difficult to drain.

This Taintor soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is slightly acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is easily tilled under optimum moisture conditions, but if worked when wet, it becomes hard and cloddy when dry. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains, and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage can be provided. Drainage is needed to reduce wetness and to provide proper aeration and a deep root zone. Tile drains function satisfactorily in this soil, but where there are wide areas of this soil outlets are a problem. This poorly drained soil tends to warm more slowly in spring than better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and avoiding tiling when the soil is wet helps maintain good tilth. If used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The land capability classification is IIw.

280—Mahaska silty clay loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on narrow flats and on the outward edges of moderately broad to broad flats in the loess-covered uplands. Areas are irregular or elongated and narrow in shape and range from 10 to 60 acres or more.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer, about 10 inches thick, is black and very dark grayish brown silty clay loam. The subsoil is about 31 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Otley, Sperry, and Taintor soils. Otley soils are on the more sloping part of this unit. Sperry soils are in depressions, and Taintor soils are on small flats. Otley soils are better drained than the Mahaska soil, Sperry soils are more poorly drained and more difficult to drain, and Taintor soils are more poorly drained.

This Mahaska soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. This soil is moderately suited to trees. Row crops can be grown most of the time. Drainage generally is adequate on this somewhat

poorly drained soil, but in wet years tile drains permit more timely field operations in some of the lower areas.

Sometimes this soil is used for pasture or hay. When this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is I.

280B—Mahaska silty clay loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to broad flats on the upper part of narrow, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer, about 8 inches thick, is black and very dark grayish brown silty clay loam. The subsoil is about 38 inches thick. The upper part is dark grayish brown and grayish brown, mottled, firm silty clay loam, and the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silt loam. In some small areas the surface layer and subsurface layer combined are more than 24 inches thick. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Colo and Nira soils. Colo soils are in the narrow drainageways, and Nira soils are on the lower part of side slopes at the most sloping part of the unit. Colo soils are more poorly drained than the Mahaska soil, and Nira soils are better drained.

This Mahaska soil has moderate permeability. The available water capacity is high, and runoff is slow or medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. This soil is wet at the head of drainageways, and if tile drains are used, field operations can be more timely. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

281B—Otley silty clay loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is adjacent to broad flats on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer, about 8 inches thick, is black and very dark grayish brown silty clay loam. The subsoil is about 33 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown and grayish brown, firm silty clay loam grading with depth to light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some places, the soil has been disturbed by excavations for streets and buildings.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Mahaska soils that are on the less sloping part of the map unit. Mahaska soils are more poorly drained than the Otley soil.

This Otley soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 3 to 4 percent organic matter. It is friable and easily tilled. The subsoil typically is low in available phosphorus and very low in available potassium.

This soil is used mainly for row crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is well suited to trees (fig. 11). If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the

Figure 11.—A windbreak around a farmstead on Otley silty clay loam, 2 to 5 percent slopes.

less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

281C—Otley silty clay loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 60 acres or more.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer, about 4 inches thick, is very dark grayish brown silty clay loam. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is brown and yellowish brown, mottled, firm silty clay loam; and the lower part is grayish brown and light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches is light brownish gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some small, severely eroded areas the surface layer is

mostly brown silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Nira soils at the head of coves and on the lower part of side slopes. Nira soils have less clay in the subsoil than the Otley soil and are grayer in the lower part of the subsoil.

This Otley soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 3 to 4 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is well suited to trees. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIIe.

281C2—Otley silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 60 acres or more.

Typically, the surface layer is very dark brown silty clay loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown subsoil material into the surface layer. The subsoil is about 42 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silty clay loam. In small, severely eroded areas the surface layer is mostly brown silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Nira soils at the heads of coves and on the lower part of side slopes. Nira soils have less clay in the subsoil than the Otley soil and are grayer in the lower part of the subsoil.

This Otley soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to grasses and legumes for hay and pasture. It is well suited to trees. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Otley soil, and it requires more production inputs to maintain higher yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIIe.

293B—Chelsea-Lamont-Fayette complex, 2 to 5 percent slopes. This complex consists of gently sloping soils on convex ridgetops and the upper part of side slopes in the uplands. About 35 percent of this complex is excessively drained Chelsea loamy fine sand, about 35 percent is well drained Lamont fine sandy loam, and about 30 percent is well drained Fayette silt loam. Chelsea and Lamont soils are generally on the higher part of the landscape. Areas of this complex are irregular in shape and range from 5 to 30 acres or more. The individual areas of the Chelsea, Lamont, and Fayette soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Chelsea soil is brown loamy fine sand about 8 inches thick. The

subsurface layer is more than 52 inches thick. The upper part is brown fine sand; the middle part is yellowish brown fine sand; and the lower part is yellowish brown fine sand with 1/2- to 2-inch bands of brown, very friable sandy loam subsoil material at depths of 40, 45, 54, and 59 inches.

Typically, the surface layer of the Lamont soil is brown fine sandy loam about 8 inches thick. The subsurface layer, about 6 inches thick, is brown fine sandy loam. The subsoil, about 25 inches thick, is dark yellowish brown and brown, very friable fine sandy loam. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 5 inches thick, is brown silt loam. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, friable silty clay loam; and the lower part is yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown silt loam. In some small, moderately eroded areas, some of the subsoil is mixed into the surface layer.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. The available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. Runoff is medium. Reaction in the surface layer of these soils is medium acid in unlimed areas, and reaction in the subsoil is medium acid or strongly acid. The organic matter content in the surface layer is 0.5 to 1.0 percent in the Chelsea and Lamont soils and is 1 to 2 percent in the Fayette soil. The surface layer of the Chelsea and Lamont soils is very friable and easily tilled. It warms early in spring and can be worked soon after rains. The subsoil of these soils is very low in available potassium. The available phosphorus is very low in the subsoil of the Chelsea soil, medium in the subsoil of the Lamont soil, and high in the subsoil of the Fayette soil.

These soils are used mainly for row crops, hay, and pasture. They are moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. If these soils are used for cultivated crops, there is a moderate hazard of erosion. The Chelsea and Lamont soils are also droughty. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, and farming on the contour can help conserve moisture and control erosion. Plowing these soils in fall subjects them to wind erosion. The hazard of wind erosion can be reduced by leaving a rough-plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of these soils for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees. Planted seedlings survive and grow well on the Lamont and Fayette soils. Planted seedlings do not survive well on the Chelsea soil unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is IIe.

293C—Chelsea-Lamont-Fayette complex, 5 to 9 percent slopes. This complex consists of moderately sloping soils on convex ridgetops and the upper part of side slopes in the uplands. About 35 percent of this complex is excessively drained Chelsea loamy fine sand, about 35 percent is well drained Lamont fine sandy loam, and about 30 percent is well drained Fayette silt loam. The Chelsea and Lamont soils are generally on the higher part of the landscape. Areas of this complex are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more. The individual areas of the Chelsea, Lamont, and Fayette soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Chelsea soil is brown loamy fine sand about 8 inches thick. The subsurface layer is more than 52 inches thick. The upper part is brown fine sand; the middle part is yellowish brown fine sand; and the lower part is yellowish brown fine sand with 1/2- to 2-inch bands of brown, very friable sandy loam subsoil material at depths of 38, 44, 52, and 58 inches.

Typically, the surface layer of the Lamont soil is brown fine sandy loam about 8 inches thick. The subsurface layer, about 4 inches thick, is brown fine sandy loam. The subsoil, about 24 inches thick, is dark yellowish brown and brown, very friable fine sandy loam. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown silt loam. In some moderately eroded areas, some of the subsoil is mixed into the surface layer. In some small, severely eroded areas, the surface layer or plow layer is mostly dark yellowish brown silty clay loam.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. The available water capacity is low in the Chelsea

soil, moderate in the Lamont soil, and high in the Fayette soil. Runoff is medium. Reaction in the surface layer of these soils is medium acid in unlimed areas, and reaction in the subsoil is medium acid or strongly acid. The organic matter content of the subsurface layer is 0.5 to 1.0 percent in the Chelsea and Lamont soils and is 1 to 2 percent in the Fayette soil. The surface layer of the Chelsea and Lamont soils is very friable and easily tilled, and it warms early in the spring and can be worked soon after rains. The surface layer of the Fayette soil is friable and easily tilled. The available phosphorus is very low in the subsoil of the Chelsea soil, medium in the subsoil of the Lamont soil, and high in the subsoil of the Fayette soil.

These soils are used mainly for row crops, hay, and pasture. They are moderately suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If these soils are used for cultivated crops, there is a severe hazard of erosion. The Chelsea and Lamont soils are droughty. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, and farming on the contour can be used to help conserve moisture and control erosion. Plowing these soils in the fall subjects them to wind erosion. The hazard of wind erosion can be reduced by leaving a rough-plowed surface and alternating plowed and unplowed strips. It can also be greatly reduced by chisel plowing, which leaves crop residue on the surface. Chisel plowing also helps to conserve moisture. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth.

The use of these soils for pasture or hay is also effective in controlling erosion. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, timely deferment of grazing, especially during dry periods, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees. Planted seedlings survive and grow well on the Lamont and Fayette soils. Planted seedlings do not survive well on the Chelsea soil unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is IIIe.

293E—Chelsea-Lamont-Fayette complex, 9 to 18 percent slopes. This complex consists of strongly sloping and moderately steep soils on convex ridgetops and side slopes in the uplands. About 35 percent of this complex is excessively drained Chelsea loamy fine sand, about 35 percent is well drained Lamont fine sandy loam, and about 30 percent is well drained Fayette silt loam. The Chelsea and Lamont soils are generally on the higher part of the landscape. Areas of this complex are irregular in shape and range from 5 to 30 acres or more. The individual areas of the Chelsea, Lamont, and Fayette soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Chelsea soil is brown loamy fine sand about 6 inches thick. The subsurface layer is more than 54 inches thick. The upper part is brown fine sand; the middle part is yellowish brown fine sand; and the lower part is yellowish brown fine sand with 1/2- to 2-inch bands of brown, very friable sandy loam subsoil material at depths of 40, 45, 54, and 59 inches.

Typically, the surface layer of the Lamont soil is brown fine sandy loam about 7 inches thick. The subsurface layer, about 4 inches thick, is brown fine sandy loam. The subsoil, about 27 inches thick, is dark yellowish brown and brown, very friable fine sandy loam. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer, about 4 inches thick, is brown silt loam. The subsoil is about 40 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown silt loam. In some small, moderately eroded areas, some of the subsoil is mixed into the surface layer.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. The available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. Runoff is rapid. Reaction in the surface layer of these soils is medium acid in unlimed areas, and reaction in the subsoil is medium acid or strongly acid. The organic matter content of the surface layer is 0.5 to 1.0 percent in the Chelsea and Lamont soils and is 1 to 2 percent in the Fayette soil. The subsoil of these soils is very low in available potassium. The available phosphorus is very low in the subsoil of the Chelsea soil, medium in the subsoil of the Lamont soil, and high in the subsoil of the Fayette soil.

These soils are used mainly for pasture, hay, and woodland. They are poorly suited to corn, soybeans, and small grains except on the steeper slopes where they are generally not suited to row crops. They are moderately suited to trees and grasses and legumes for hay and pasture. These soils are very highly susceptible to erosion. The Chelsea and Lamont soils are droughty. The use of these soils for pasture or hay is effective in controlling erosion. Improved pasture is suitable in some areas of these strongly sloping to moderately steep soils; however, the operation of farm machinery can be both difficult and dangerous on the steeper slopes. Permanent pastures can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once

the permanent pasture is established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

These soils are moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Where the slope of these soils is moderately steep, the operation of farm equipment is somewhat hazardous. Special equipment can be used, but with caution. Natural and planted seedlings survive and grow well on the Lamont and Fayette soils, but they do not survive well on the Chelsea soil. On the Chelsea soil, however, seedlings can be planted closely together and thinned later to achieve the desired stand density.

The land capability classification is VIe.

293F—Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes. This complex consists of steep soils on convex ridgetops and side slopes in the uplands. About 35 percent of this complex is excessively drained Chelsea loamy fine sand, about 35 percent is well drained Lamont fine sandy loam, and about 30 percent is well drained Fayette silt loam. Chelsea and Lamont soils are generally higher on the landscape. Areas of this complex are irregular in shape and range from 5 to 30 acres or more. The areas of the Chelsea, Lamont, and Fayette soils are so closely intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Chelsea soil is brown loamy fine sand about 5 inches thick. The subsurface layer is more than 55 inches thick. The upper part is brown fine sand; the middle part is yellowish brown fine sand; and the lower part is yellowish brown fine sand with 1/2- to 2-inch bands of brown, very friable sandy loam subsoil material at depths of 40, 45, 54, and 59 inches.

Typically, the surface layer of the Lamont soil is brown fine sandy loam about 6 inches thick. The subsurface layer, about 4 inches thick, is brown fine sandy loam. The subsoil, about 22 inches thick, is dark yellowish brown and brown, very friable fine sandy loam. The substratum to a depth of 60 inches or more is yellowish brown loamy fine sand.

Typically, the surface layer of the Fayette soil is dark grayish brown silt loam about 6 inches thick. The subsurface layer, about 3 inches thick, is brown silt loam. The subsoil is about 38 inches thick. The upper part is dark yellowish brown, friable silty clay loam, and the lower part is yellowish brown, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown silt loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Permeability is rapid in the Chelsea soil, moderately rapid in the Lamont soil, and moderate in the Fayette soil. The available water capacity is low in the Chelsea soil, moderate in the Lamont soil, and high in the Fayette soil. Runoff is very rapid. Reaction in the surface layer of these soils is medium acid in unlimed areas, and the reaction in the subsoil is medium acid or strongly acid. The organic matter content of the surface layer is 0.5 to 1.0 percent in the Chelsea and Lamont soils and is 1 to 2 percent in the Fayette soil. The subsoil of these soils is very low in available potassium. The available phosphorus is very low in the subsoil of the Chelsea soil, medium in the subsoil of the Lamont soil, and high in the subsoil of the Fayette soil.

These soils are used mainly for woodland, pasture, and wildlife. These soils are not suited to cultivated crops. They are poorly suited to hay and pasture. They are moderately suited to trees, openland wildlife habitat, and woodland wildlife habitat.

These steep soils are very highly susceptible to erosion, and they are not suitable for row crops. These soils are poorly suited to grasses and legumes for pasture; however, the use of these soils for pasture is effective in controlling erosion. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition. The use of ordinary farm machinery is both difficult and dangerous on the steep slopes.

These soils are moderately suited to trees, and a few small areas remain in native hardwoods. Trees grow best on the lower part of northerly and easterly slopes and in coves. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Natural and planted seedlings survive and grow well on the Lamont and Fayette soils, but they do not survive well on the Chelsea soil. On the Chelsea soil, however, seedlings can be planted closely together and thinned later to achieve the desired stand density.

The land capability classification is VIIe.

315—Klum-Perks-Nodaway complex, 1 to 3 percent slopes. This complex consists of very gently sloping soils on flood plains. About 40 percent of this complex is moderately well drained Klum fine sandy loam, about 30 percent is excessively drained Perks loamy sand, and about 20 percent is moderately well drained Nodaway silt loam. These soils are subject to flooding. The Klum and Nodaway soils are in the lower areas, and the Perks soil is in the higher areas. Areas of this complex are elongated, narrow, and irregular in shape and range from 10 to 60 acres or more. The areas of the Klum, Perks, and Nodaway soils are so closely intermingled or so

small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Klum soil is very dark grayish brown fine sandy loam about 8 inches thick. The substratum to a depth of 60 inches or more is stratified very dark grayish brown and dark brown fine sandy loam in the upper part; brown loamy fine sand in the middle part; and brown sand in the lower part.

Typically, the surface layer of the Perks soil is brown loamy sand about 6 inches thick. The substratum to a depth of 60 inches or more is brown and dark brown sand.

Typically, the surface layer of the Nodaway soil is very dark grayish brown silt loam about 9 inches thick. The substratum to a depth of 60 inches or more is stratified dark grayish brown, very dark grayish brown, and grayish brown silt loam that contains thin strata of sandy loam, loam, and loamy sand below a depth of 44 inches.

Included with this complex in mapping and making up about 10 percent of the map unit are small areas of Colo soils in depressions and along drainageways near the Nodaway soil. Colo soils are more poorly drained and more difficult to drain than the Nodaway soil.

Permeability is moderately rapid in the Klum soil, rapid in the Perks soil, and moderate in the Nodaway soil. The available water capacity is low in the Klum soil, very low in the Perks soil, and very high in the Nodaway soil. The runoff from these soils is slow. The Klum and Nodaway soils have a seasonal high water table.

Except in limed areas, reaction in the surface layer of the Perks soil is medium acid, and reaction in the surface layer of the Klum and Nodaway soils is neutral. The organic matter content of the surface layer is 0.5 to 1.5 percent in the Klum soil, about 0.5 percent in the Perks soil, and 2 to 3 percent in the Nodaway soil. The surface layer of the Klum and Perks soils is very friable and very easily tilled, and the plow layer warms early in spring and can be worked soon after rains. The surface layer of the Nodaway soil is friable and easily tilled. The substratum is very low in available phosphorus and potassium in the Klum and Perks soils and is medium in available phosphorus and potassium in the Nodaway soil.

These soils are used mostly for cultivated crops, hay, and pasture. They are moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. In wet years, the soils are subject to flooding in spring. This can cause planting to be delayed. Row crops can be grown much of the time.

Crop management is difficult because these soils are subject to flooding in spring and are droughty in summer. Conservation tillage helps conserve moisture. Plowing these soils in fall permits more timely field operations in spring. It also subjects them to wind erosion, but this can be reduced by leaving a rough-plowed surface and alternating plowed and unplowed strips. Chisel plowing, which leaves crop residue on the soil surface, greatly reduces the hazard of wind erosion. Returning crop residue to the soil or the regular addition of other organic material helps maintain tilth and increases fertility and water infiltration.

Pasture management is difficult on these soils because they are subject to flooding and are droughty during dry periods. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, proper stocking, pasture rotation, deferment of grazing during dry periods, and restricted use during wet periods are essential to keep the pasture and soils in good condition.

These soils are moderately suited to trees. The seedlings planted on the Klum and Nodaway soils will survive and grow well, but seedlings planted on the Perks soil do not survive well unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is IIIs.

362—Haig silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad flats in the loess-covered uplands. Areas are irregular in shape and range from 40 to 400 acres or more.

Typically, the surface layer is black silt loam about 9 inches thick. The subsurface layer, about 8 inches thick, is black and very dark gray silty clay loam. The subsoil is more than 43 inches thick. The upper part is very dark gray and dark gray, mottled, very firm silty clay; the middle part is olive gray, mottled, very firm silty clay; and the lower part is light olive gray, mottled, firm and friable silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Edina and Grundy soils. Edina soils are in shallow depressions, and Grundy soils are on the more sloping part of the map unit. Edina soils have more clay in the upper part of the subsoil and are more difficult to drain than the Haig soil, and Grundy soils are better drained.

This Haig soil has slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage can be provided. Drainage is needed to reduce wetness and to provide

proper aeration and a deep root zone. Tile drains are not satisfactory in all areas of this slowly permeable soil, and surface drains are needed in depressions. Where there are wide areas of this soil, outlets are a problem. This soil tends to warm more slowly in spring than more permeable, better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and avoiding tilling the soil when it is wet help to maintain good tilth. If used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The land capability classification is IIw.

363—Haig silty clay loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad flats in the loess-covered uplands. Areas are irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer, about 8 inches thick, is black and very dark gray silty clay loam. The subsoil is about 38 inches thick. The upper part is very dark gray, mottled, very firm silty clay; the middle part is olive gray, mottled, very firm silty clay; and the lower part is light olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Edina soils in shallow depressions. Edina soils have more clay in the upper part of the subsoil than the Haig soil and are more difficult to drain.

This Haig soil has slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The heavy silty clay loam surface layer contains 3 to 4 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it can become very hard and cloddy when dry. The subsoil is low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage can be provided. Tile drains are not satisfactory in all areas. Where there are wide areas of this soil, adequate outlets are a problem. Open ditches, surface drainage, landshaping, and bedding are all used to remove surface water. This soil warms slowly in spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. This soil is fairly difficult to manage, and farming operations need to be timely. Although plowing this soil in the fall allows for timely farming operations, it subjects the soil to wind erosion. This can be reduced by leaving a rough-plowed surface and alternating plowed and unplowed strips. Erosion can also be reduced by chisel plowing, which leaves crop residue on the surface. Overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. An occasional year of meadow improves tilth and helps to control weeds and insects.

The land capability classification is IIw.

364B—Grundy silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to broad flats on convex ridgetops and on the upper part of side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 20 to 80 acres or more.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer, about 6 inches thick, is very dark gray silty clay loam. The subsoil is about 34 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay, and the lower part is grayish brown and olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Arispe and Haig soils. Arispe soils are on the lower part of side slopes, and Haig soils are on the less sloping part of the unit. Arispe soils are better drained than the Grundy soil, and Haig soils are more poorly drained.

This Grundy soil has slow permeability. The available water capacity is high, and runoff is slow or medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low or low in available phosphorus and low or medium in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a

minimum depth to prevent exposure of the clayey subsoil. Seepage can occur in the terrace channels. This soil tends to warm more slowly in spring than more permeable soils, and it dries more slowly after rains. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

424D—Lindley-Keswick loams, 9 to 14 percent slopes. This complex consists of strongly sloping soils on short, convex side slopes and on convex nose slopes in the uplands. It is about 60 percent Lindley loam and about 30 percent Keswick loam. The well drained Lindley soil is on the lower part of the slopes, and the moderately well drained Keswick soil is on the upper part. Areas of this complex are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more. The individual areas of Lindley and Keswick soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 4 inches thick. The subsurface layer, about 5 inches thick, is grayish brown loam. The subsoil is about 40 inches thick. It is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown, mottled clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some small, severely eroded areas the surface layer is yellowish brown clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown loam about 5 inches thick. The subsurface layer, about 6 inches thick, is grayish brown loam. The subsoil is more than 49 inches thick. The upper part is strong brown, very firm clay with reddish brown and dark reddish brown mottles; the middle part is yellowish brown, mottled, firm clay loam; and the lower part is yellowish brown and grayish brown, mottled, firm clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some small, severely eroded areas the surface layer is mostly strong brown clay.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Clinton, Douds, Galland, and Weller soils. Clinton and Weller soils are on the upper part of side slopes near the Keswick soil, and Douds and Galland soils are on the lower part of side slopes near the Lindley soil. Clinton and Weller soils contain less sand than Keswick and Lindley soils, and Douds and Galland soils are more stratified. Galland soils are more poorly drained than the Lindley soil.

The Lindley soil has moderately slow permeability, and the Keswick soil has slow permeability. The available water capacity is high in the Lindley soil and moderate or high in the Keswick soil. Runoff is rapid. The Keswick soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high in the Keswick soil. Reaction in the surface layer of both soils is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. The subsoil of the Lindley soil is medium in available phosphorus and very low in available potassium, and the subsoil of the Keswick soil is very low in available phosphorus and available potassium.

These soils are used mainly for pasture, hay, row crops, and woodland. They are poorly suited to corn, soybeans, and small grains. They are moderately suited to trees and to grasses and legumes for hay and pasture. Tillage for row crops creates a very severe hazard of erosion. Row crops can be grown some of the time on these soils if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage can occur in terrace channels on the upper part of slopes. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of these soils for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of these soils. Pasture management on the seepy upper part of slopes can be difficult in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings in areas of the Lindley soil should survive well if proper species are selected and managed properly. Planted seedlings in areas of the Keswick soil will not survive well unless they are planted closely together and thinned later to achieve the desired stand density. In areas of the Keswick soil, the use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

424D2—Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded. This complex consists of strongly sloping soils on short, convex side slopes and convex nose slopes in the uplands. It is about 60 percent Lindley loam and about 30 percent Keswick loam. The well drained Lindley soil is on the lower part of side slopes, and the moderately well drained Keswick soil is on the upper part. The areas of this complex are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more. The individual areas of the Lindley and Keswick soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of subsoil material into the surface layer. The subsoil, about 38 inches thick, is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown clay loam. In some small, severely eroded areas the surface layer is mostly yellowish brown clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of strong brown clay subsoil material into the surface layer. The subsoil is more than 54 inches thick. The upper part is strong brown, very firm clay with reddish brown and dark reddish brown mottles; and the lower part is yellowish brown and grayish brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly strong brown clay.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Clinton, Douds, Galland, and Weller soils. Clinton and Weller soils are on the upper part of side slopes near the Keswick soil, and Douds and Galland soils are on the lower part of side slopes near the Lindley soil. Clinton and Weller soils have less sand than Keswick and Lindley soils. Douds and Galland soils are more stratified than Keswick and Lindley soils. Galland soils are more poorly drained than the Lindley soil.

The Lindley soil has moderately slow permeability, and the Keswick soil has slow permeability. The available water capacity is high in the Lindley soil and moderate or high in the Keswick soil. Runoff is rapid. The Keswick soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high in the Keswick soil. Reaction in the surface layer of both soils is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The subsoil of the Lindley soil is medium in available phosphorus and very low in available potassium, and the subsoil of the Keswick soil is very low in available phosphorus and available potassium.

These soils are used mainly for pasture, hay, and row crops. They are poorly suited to corn, soybeans, and small grains, and they are moderately suited to trees and to grasses and legumes for hay and pasture. Tillage for row crops creates a very severe hazard of erosion. Row crops can be grown some of the time on these soils if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, help to reduce erosion. In some places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage can occur in terrace channels on the upper part of slopes. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of these soils for pasture or hay is also effective in controlling erosion. Improved permanent pasture slowly increases the organic matter content of these moderately eroded soils. Pasture management on the seepy upper part of slopes can be difficult in the spring and early in summer. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees. Hardwood seedlings require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods to eroded or formerly cultivated soils. If these soils are planted to trees, the seedlings in areas of the Lindley soil should survive well if proper species are selected and managed properly. Planted seedlings in areas of the Keswick soil will not survive well unless they are planted closely together and thinned later to achieve the desired stand density. In areas of the Keswick soil, the use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IVe.

424E—Lindley-Keswick loams, 14 to 18 percent slopes. This complex consists of moderately steep, well drained and moderately well drained soils on short, convex side slopes and convex nose slopes in the uplands. It is about 60 percent Lindley loam and about 30 percent Keswick loam. The well drained Lindley soil occupies the lower part of side slopes, and the moderately well drained Keswick soil occupies the upper part. The areas of this complex are elongated, narrow,

and irregular in shape and range from 5 to 30 acres or more. The individual areas of the Lindley and Keswick soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Lindley soil is very dark grayish brown loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is brown, firm clay loam, and the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. Also, in some small, severely eroded areas the surface layer is brown clay loam.

Typically, the surface layer of the Keswick soil is very dark grayish brown loam about 4 inches thick. The subsurface layer is dark grayish brown loam about 7 inches thick. The subsoil is more than 49 inches thick. The upper part is brown, firm clay loam; the middle part is brown, very firm clay with dark reddish brown mottles grading with depth to strong brown clay with reddish brown mottles; and the lower part is strong brown and yellowish brown, mottled, firm clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. Also, in some small, severely eroded areas the surface layer is mostly brown clay loam.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Clinton, Douds, Galland, and Weller soils. Clinton and Weller soils are on the upper part of side slopes near the Keswick soil, and Douds and Galland soils are on the lower part of side slopes near the Lindley soil. Clinton and Weller soils contain less sand than Keswick and Lindley soils, and Douds and Galland soils are more stratified. Galland soils are more poorly drained than the Lindley soil.

The Lindley soil has moderately slow permeability, and the Keswick soil has slow permeability. The available water capacity is high in the Lindley soil and moderate or high in the Keswick soil. Runoff is rapid. The Keswick soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high in the Keswick soil. Reaction in the surface layer of both soils is medium acid in unlimed areas, and reaction in the subsoil commonly is strongly acid. The surface layer contains 1 to 2 percent organic matter. The subsoil of the Lindley soil is medium in available phosphorus and very low in available potassium, and the subsoil of the Keswick soil is very low in available phosphorus and available potassium.

These soils are used mainly for pasture, hay, and woodland. They are generally not suited to corn, soybeans, and small grains, and they are moderately suited to trees and grasses and legumes for hay and pasture.

These moderately steep soils are very highly susceptible to erosion, and they are generally not suited to row crops. The use of these soils for pasture or hay is effective in controlling erosion. Improved pastures are suitable in some areas of these moderately steep soils. Pasture management on the seepy upper part of slopes can be difficult in spring and early summer. The operation of farm machinery can be both difficult and dangerous. Pastures can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees, and a few small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Survival of seedlings should not be a problem on the uneroded Lindley soil, but in areas of the Keswick soil and in small eroded areas, seedlings do not survive well. Seedlings can be planted closely together and thinned later to achieve the desired stand density. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. In areas of the Keswick soil, the use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is VIe.

424E2—Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded. This complex consists of moderately steep, well drained and moderately well drained soils on short, convex side slopes and convex nose slopes in the uplands. It is about 60 percent Lindley loam and about 30 percent Keswick loam. The well drained Lindley soil is on the lower part of side slopes, and the moderately well drained Keswick soil is on the upper part. Areas of this complex are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more. The individual areas of the Lindley and Keswick soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Lindley soil is dark grayish brown loam about 4 inches thick. Generally, plowing has mixed some streaks and pockets of yellowish brown clay loam subsoil material into the surface layer. The subsoil is about 41 inches thick. It is yellowish brown, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some small, severely eroded areas the surface layer is mostly yellowish brown clay loam.

Typically, the surface layer of the Keswick soil is dark grayish brown loam about 6 inches thick. Generally,

plowing has mixed some streaks and pockets of yellowish brown clay loam subsoil material into the surface layer. The subsoil is more than 54 inches thick. The upper part is yellowish brown, firm clay loam; the middle part is brown, very firm clay with reddish brown mottles grading with depth to strong brown clay with reddish brown mottles; and the lower part is yellowish brown and grayish brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly yellowish brown clay loam.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Clinton, Douds, Galland, and Weller soils. Clinton and Weller soils are on the upper part of side slopes near the Keswick soil, and Douds and Galland soils are on the lower part of side slopes near the Lindley soil. Clinton and Weller soils contain less sand than Keswick and Lindley soils, and Douds and Galland soils are more stratified. Galland soils are more poorly drained than the Lindley soil.

The Lindley soil has moderately slow permeability, and the Keswick soil has slow permeability. The available water capacity is high in the Lindley soil and moderate or high in the Keswick soil. Runoff is rapid. The Keswick soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high in the Keswick soil. Reaction in the surface layer of both soils is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer of these soils contains 0.5 to 1.5 percent organic matter. The subsoil of the Lindley soil is medium in available phosphorus and very low in available potassium and the subsoil of the Keswick soil is very low in available phosphorus and available potassium.

These soils are used mainly for pasture and hay. They are generally not suited to corn, soybeans, and small grains, and they are moderately suited to poorly suited to trees and grasses and legumes for hay and pasture.

These moderately steep soils are very highly susceptible to erosion damage, and they are generally not suited to row crops. The use of these soils for pasture or hay is effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of these soils. Pasture management on the seepy upper part of slopes can be difficult in the spring and early summer. Permanent pasture can be improved by renovating and reseeding. Preparation of the seedbed is difficult. The operation of farm machinery can be both difficult and dangerous because of the moderately steep slope. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees. Hardwood seedlings require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods on eroded or formerly cultivated soils. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Planted seedlings on these moderately eroded soils do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. In areas of the Keswick soil, the use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is VIe.

425D—Keswick loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is on short, convex side slopes and convex nose slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer, about 7 inches thick, is grayish brown loam. The subsoil is more than 50 inches thick. The upper part is strong brown, mottled, firm clay loam; the middle part is reddish brown, mottled, very firm clay; and the lower part is strong brown and yellowish brown, mottled, firm clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some small, severely eroded areas the surface layer is mainly strong brown clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Clinton, Lindley, and Weller soils. The Clinton and Weller soils are on the upper part of the side slopes, and the Lindley soils are on the lower part. Clinton and Lindley soils are better drained than the Keswick soil, and Clinton and Weller soils contain less sand.

This Keswick soil has slow permeability. The available water capacity is moderate or high, and runoff is rapid. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, hay, and woodland. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture. The tillage of row crops creates a very severe erosion hazard, but row crops can be grown some of the time if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and

conservation tillage, a practice that leaves crop residue on the surface throughout the year, all can reduce erosion. Intensive cultivation is not possible, because the rate of soil loss on this strongly sloping soil generally is too great. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage can occur in terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Pasture management on this seepy soil can be difficult in spring and early summer. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IVe.

425D2—Keswick loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on short, convex side slopes and convex nose slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of strong brown clay loam subsoil material into the surface layer. The subsoil is more than 55 inches thick. The upper part is strong brown, mottled, firm clay loam; the middle part is reddish brown and strong brown, mottled, very firm clay; and the lower part is yellowish brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly strong brown clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Clinton, Lindley, and Weller soils. The Clinton and Weller soils are on the upper part of the side slopes, and the Lindley soils are on the lower part. Clinton and Lindley soils are better drained than the Keswick soil, and Clinton and Weller soils contain less sand.

This Keswick soil has slow permeability. The available water capacity is moderate or high, and runoff is rapid. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, hay, and row crops. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture. The tillage of row crops creates a very severe hazard of erosion, but row crops can be grown some of the time on this soil if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture of hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this seepy soil can be difficult in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. Conifers are better suited than hardwoods on this moderately eroded soil. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IVe.

452D2—Lineville silt loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil

is over 53 inches thick. The upper part is brown, mottled, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, friable clay loam; and the lower part is yellowish brown, mottled, firm clay loam and strong brown, mottled, very firm clay. In places slopes are less than 9 percent. In some severely eroded areas, the surface layer is mostly brown silty clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong, Ladoga, and Rinda soils. Armstrong and Rinda soils are on the lower part of side slopes, and Ladoga soils are on the upper part. Armstrong and Rinda soils contain more clay in the subsoil than the Lineville soil, Ladoga soils contain less sand, and Rinda soils are more poorly drained.

The permeability of the Lineville soil is moderately slow in the upper part of the soil and slow or very slow in the lower part. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for hay, pasture, and row crops. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and to grasses and legumes for hay and pasture. Tillage for row crops creates a very severe hazard of erosion, but row crops can be grown some of the time if adequate protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Seepage can occur in terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. There should be no problems encountered in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IVe.

453—Tuskeego silt loam, 0 to 2 percent slopes. This nearly level, poorly drained soil is on low stream terraces and is rarely flooded. Areas are irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 9 inches thick, is dark grayish brown and grayish brown silt loam. The subsoil is more than 43 inches thick. The upper part is dark gray and grayish brown, mottled, friable silty clay loam; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is olive gray, mottled, firm silty clay loam. In some places, the surface layer is black silt loam about 12 inches thick. In some places, the slopes are 2 to 5 percent.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small, random areas of Coppock soils throughout the unit. Coppock soils contain less clay than the Tuskeego soil and are more permeable and easier to drain.

This Tuskeego soil has very slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, to trees, and to grasses and legumes for hay and pasture. Row crops can be grown much of the time on this soil if adequate drainage can be provided. Tile drains generally are not satisfactory on this very slowly permeable soil, and outlets are a problem in wide areas and in low-lying areas. Open ditches, surface drainage, land shaping, and bedding are all used to remove surface water. This soil warms slowly in spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. Because this soil is fairly difficult to manage, farming operations need to be timely. An occasional year of meadow improves tilth and helps to control weeds and insects.

Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use

during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. This soil is poorly drained, and the use of equipment will need to be restricted to drier periods or during winter months when the ground is frozen. Special high flotation equipment may also be used for harvesting or management if it is necessary during wet periods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the windthrow hazard.

The land capability classification is IIIw.

478G—Nordness-Rock outcrop complex, 25 to 40 percent slopes. This complex consists of very steep, shallow soils and Rock outcrops on bluffs. It is about 50 percent well drained Nordness silt loam and 40 percent Rock outcrop. Areas of this complex are elongated, narrow, and irregular in shape and range from 10 to 40 acres or more. The areas of the Nordness soil and of Rock outcrop are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Nordness soil is dark grayish brown silt loam about 5 inches thick. The subsoil is about 10 inches thick. The upper part is dark yellowish brown, mottled, friable silty clay loam, and the lower part is brown, mottled, firm silty clay loam. The substratum is hard, fractured, level-bedded limestone bedrock. In some small, severely eroded areas, the surface layer of the Nordness soil is mostly dark yellowish brown silty clay loam.

Typically, the Rock outcrop consists of limestone outcrops (fig. 12). In places there are small areas of sandstone outcrops and shale outcrops.

Included with this complex in mapping and making up about 10 percent of the map unit are small areas of Lindley soils on the upper part of the side slopes. Lindley soils are deeper than the Nordness soil and contain more sand.

This Nordness soil has moderate permeability. The available water capacity is very low, and runoff is very rapid. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer is less than 0.5 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mostly for woodland, pasture, and wildlife. It is not suitable for cultivated crops. It is poorly suited to hay, pasture, trees, openland wildlife habitat, and woodland wildlife habitat. This very steep soil is very highly susceptible to erosion. The use of this soil for pasture is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition. On these very steep, rocky slopes, the use of farm machinery is not suitable.

This soil is poorly suited to trees, and small areas remain in native hardwoods. The hazard of erosion can be reduced by placing logging trails or roads on the contour. Because of the steepness of slope, the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. Natural and planted seedlings do not survive well, unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is VIIs.

484—Lawson silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on the flood plain and is subject to flooding. Areas are irregular in shape and range from 10 to 40 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer, about 21 inches thick, is very dark grayish brown silt loam. The substratum to a depth of 60 inches or more is stratified dark brown, dark grayish brown, and very dark grayish brown silt loam. In places the dark colored surface layer and subsurface layer are less than 10 inches thick and in some places they are over 36 inches thick. In places the surface layer, the subsurface layer, and the substratum are silty clay loam.

This Lawson soil has moderate permeability. The available water capacity is very high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer and substratum is neutral. The surface layer typically contains about 4 to 5 percent organic matter. It is friable and easily tilled. The substratum is low in available phosphorus and very low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate flood protection can be provided. In many places, diversion terraces are needed on adjacent foot slopes to protect this soil against runoff from higher areas. Returning crop residue to the soil and not tilling when the soil is wet help to maintain good tilth.

Pasture management can be difficult because the soil is subject to flooding. Permanent pastures can be improved by renovating and reseeding. Once the pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is IIw.

Figure 12.—Rock outcrop on Nordness-Rock outcrop complex, 25 to 40 percent slopes.

499D—Nordness silt loam, 9 to 14 percent slopes. This shallow, strongly sloping, well drained soil is on convex side slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is about 13 inches thick. The upper part is dark yellowish brown, mottled, friable silty clay loam, and the lower part is brown, mottled, firm silty clay loam. The substratum is hard, fractured, level-bedded limestone bedrock. In some moderately eroded areas, some of the subsoil is mixed into the surface layer, and also in some small, severely eroded areas, the surface layer is mostly dark yellowish brown silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of limestone outcrops, shale outcrops, and Lindley soils. The areas of

limestone outcrops and shale outcrops occur at random, and the Lindley soils are on the upper part of the side slopes. The Lindley soils are deeper than the Nordness soil and contain more sand.

This Nordness soil has moderate permeability. The available water capacity is very low, and runoff is rapid. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 1 to 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, woodland, and wildlife. It is generally not suited to cultivated crops. It is poorly suited to hay, pasture, trees, openland wildlife habitat, and woodland wildlife habitat.

This soil is poorly suited to grasses and legumes for hay and pasture. It is very highly susceptible to erosion. The use of this soil for pasture or hay is effective in controlling erosion, but hay and pasture management on this shallow soil is difficult. Permanent pastures can be improved by renovating, liming, and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees, and small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density.

The land capability classification is VIe.

499F—Nordness silt loam, 14 to 25 percent slopes. This shallow, moderately steep to steep, well drained soil is on convex side slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is very dark grayish brown, dark grayish brown, and brown silt loam about 5 inches thick. The subsoil is about 10 inches thick. The upper part is dark yellowish brown, mottled, friable silty clay loam, and the lower part is brown, mottled, firm silty clay loam. The substratum is hard, fractured, level-bedded limestone bedrock. In some moderately eroded areas, some of the subsoil is mixed into the surface layer, and also in some small, severely eroded areas, the surface layer is mostly dark yellowish brown silty clay loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of limestone outcrops, shale outcrops, and Lindley soils. The areas of limestone outcrops and shale outcrops occur at random, and the Lindley soils are on the upper part of the side slope. The Lindley soils are deeper than the Nordness soil and contain more sand.

This Nordness soil has moderate permeability. The available water capacity is very low, and runoff is rapid or very rapid. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 0.5 to 1.0 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, woodland, and wildlife. It is not suited to cultivated crops. It is poorly suited to hay, pasture, trees, openland wildlife habitat, and woodland wildlife habitat.

This soil is poorly suited to grasses and legumes for hay and pasture. It is very highly susceptible to erosion. The use of this soil for pasture or hay is effective in controlling erosion, but hay and pasture management on this shallow soil is difficult. Improved pastures are suitable in some areas, but because this soil is moderately steep or steep, the operation of farm machinery can be both difficult and dangerous. Permanent pastures can be improved by renovation, liming, and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees, and a few areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The hazard of erosion can be reduced by placing logging trails or roads on the contour or nearly on the contour. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution.

The land capability classification is VIIe.

520—Coppock silt loam, 0 to 2 percent slopes. THis nearly level, somewhat poorly drained or poorly drained soil is on very low stream terraces, foot slopes, and alluvial fans. It is subject to flooding. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 17 inches thick, is dark grayish brown and grayish brown silt loam. The subsoil is more than 35 inches thick. It is light brownish gray, mottled, friable silty clay loam. In places, the surface layer is about 12 inches thick.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Tuskeego soils. Tuskeego soils are on the highest part of this unit. They contain more clay in the subsoil than the Coppock soil and are more difficult to drain.

This Coppock soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time on this soil if adequate drainage can be provided, but tile drains generally are not very satisfactory on the low-lying bottom land that is subject to flooding. Open ditches, surface drainage, landshaping, and bedding are all used to remove surface water. This soil warms slowly in the spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. Returning crop residue to the soil and avoiding tilling when the soil is wet help maintain good tilth. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIw.

570C—Nira silty clay loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is in coves at the heads of drainageways and on convex side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer, about 5 inches thick, is very dark grayish brown silty clay loam. The subsoil is about 34 inches thick. The upper part is brown, firm silty clay loam; the middle part is yellowish brown, mottled, firm silty clay loam grading with depth to grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer, and in some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some places the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are areas of Mahaska and Otley soils. Mahaska soils are at the head of drainageways on the less sloping part of the unit. Otley soils are on the upper part of the side slopes. Mahaska soils are more poorly drained than the Nira soil, and Otley soils contain more clay in the subsoil.

This Nira soil has moderate permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains about 3 to 4 percent organic matter. It is friable and easily tilled. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIIe.

570C2—Nira silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is in coves at the head of drainageways and on convex side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown subsoil material into the surface layer. The subsoil is about 33 inches thick. The upper part is brown, friable silty clay loam; the middle part is grayish brown and yellowish brown, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silty clay loam. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are areas of Mahaska and

Otley soils. Mahaska soils are at the head of drainageways on the less sloping part of the unit. Otley soils are on the upper part of the side slopes. Mahaska soils are more poorly drained than the Nira soil, and Otley soils contain more clay in the subsoil.

This soil has moderate permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. This soil is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Nira soil and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of the soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

The land capability classification is IIIe.

571B—Hedrick silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is adjacent to narrow to moderately broad flats on the upper part of narrow, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. Areas are irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is brown, firm silty clay loam; the middle part is grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Givin and Ladoga soils. Givin soils are on the less sloping part of the unit. Ladoga soils are on the upper part of side slopes. Givin soils are more poorly drained than the Hedrick soil, and Ladoga soils contain more clay in the subsoil.

This Hedrick soil has moderate permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

571C2—Hedrick silt loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is in coves at the head of drainageways and on convex side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay

loam subsoil material into the surface layer. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silt loam. In some small, severely eroded areas the surface layer is mostly brown silty clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ladoga and Rinda soils. Ladoga soils are on the upper part of the side slopes, and Rinda soils are on the lower part. Ladoga soils contain more clay in the subsoil than the Hedrick soil, and Rinda soils are more poorly drained and are seepy during wet periods.

This Hedrick soil has moderate permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Hedrick soil and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

594C2—Galland loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on high stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of brown clay loam subsoil material into the surface layer. The subsoil is more than 54 inches thick. The upper part is brown, friable clay loam; the middle part is brown and grayish brown, very firm clay with dark reddish brown and yellowish red mottles; and the lower part is strong brown and grayish brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly brown clay loam. In some small, uneroded areas the surface layer is dark grayish brown loam about 5 inches thick, and the subsurface layer is brown loam about 6 inches thick.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Cantril, Douds, and Lindley soils. The Cantril soils are on the lower part of foot slopes, and the Douds and Lindley soils are on the upper part of side slopes. All of these soils have less clay in the subsoil than the Galland soil, and in most areas, Douds and Lindley soils are better drained.

This Galland soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, hay, and row crops. It is moderately suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If the soil is used for crops, there is a severe hazard of erosion. Row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Intensive use for row crops

causes the surface layer to puddle readily after rains and to form a crust as the soil dries. A rotary hoe or other such equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this seepy soil can be difficult in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

594D2—Galland loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on high stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown clay loam subsoil material into the surface layer. The subsoil is about 47 inches thick. The upper part is brown and reddish brown, mottled, firm clay loam; the middle part is strong brown, grayish brown, and reddish brown, mottled, very firm clay; and the lower part is grayish brown, strong brown, and yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silt loam. In some small, severely eroded areas, the surface layer is mostly brown clay loam. In some small uneroded areas, the surface layer is very dark grayish brown loam about 9 inches thick.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Clinton, Douds, Lindley, and Nordness soils. These soils are on the upper part of side slopes. Clinton soils contain less sand than the Galland soil. Douds and Lindley soils contain less clay. In addition, Lindley soils are less stratified than the Galland soil. Nordness soils are shallow to bedrock. In most areas, all of these soils are better drained than the Galland soil.

This Galland soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture, hay, and row crops. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture. The tillage of row crops creates a very severe hazard of erosion. Row crops can be grown some of the time if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, can reduce erosion. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this seepy soil can be difficult in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

594E—Galland loam, 14 to 18 percent slopes. This moderately steep, moderately well drained or somewhat poorly drained soil is on high stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer, about 4 inches thick, is brown loam. The subsoil is more than 48 inches thick. The upper part is brown, mottled, firm clay loam; the middle part is yellowish red, mottled, very firm

clay; and the lower part is yellowish red, mottled, very firm clay grading with depth to strong brown, mottled, friable loam. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer. In some severely eroded areas the surface layer is mostly brown clay loam. In some areas adjacent to Gara soils, the surface layer is very dark grayish brown loam about 9 inches thick.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Douds, Lindley, and Nordness soils on the upper part of side slopes. Nordness soils are also on the lower part of side slopes. Douds and Lindley soils contain less clay, and Lindley soils are less stratified than the Galland soil. Nordness soils are shallow to bedrock. In most areas, all of these soils are better drained than the Galland soil.

This Galland soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas; and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture and hay. It is generally not suited to corn, soybeans, and small grains, and it is poorly suited to grasses and legumes for hay and pasture. It is moderately suited to trees.

This moderately steep soil is very highly susceptible to erosion, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. Pasture management on this seepy soil can be difficult in the spring and early summer. Improved pastures are suitable in some areas, but because this soil is moderately steep the operation of farm machinery can be both difficult and dangerous. Permanent pasture can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The hazard of erosion can be reduced by placing logging trails or roads on the contour. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is VIe.

594E2—Galland loam, 14 to 18 percent slopes, moderately eroded. This moderately steep, moderately well drained or somewhat poorly drained soil is on high stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of strong brown clay loam subsoil material into the surface layer. The subsoil is about 50 inches thick. The upper part is strong brown, firm clay loam with dark reddish brown and yellowish red mottles; the middle part is strong brown, mottled, very firm clay; and the lower part is yellowish brown and grayish brown, mottled, firm clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown, mottled, friable sandy loam. In some small, severely eroded areas the surface layer is mostly strong brown clay loam with dark reddish brown and yellowish red mottles.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Douds, Lindley, and Nordness soils on the upper part of side slopes. Nordness soils are also on the lower part of side slopes. Douds and Lindley soils contain less clay than the Galland soil, and Lindley soils are less stratified. Nordness soils are shallow to bedrock. In most areas, all these soils are better drained than the Galland soil.

This Galland soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for pasture and hay. It is generally not suited to corn, soybeans, and small grains, and it is poorly suited to grasses and legumes for hay and pasture. It is moderately suited to trees.

This moderately steep soil is very highly susceptible to erosion, and it is generally not suited to row crops. The use of this soil for pasture or hay is effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management of this seepy soil can be difficult in the spring and early summer. Improved pastures are suitable in some areas, but because this soil is moderately steep the operation of farm machinery can be both difficult and dangerous. Permanent pastures can be improved by renovating and reseeding. Preparation of the seedbed is difficult. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and increases runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The hazard of erosion can be reduced by placing logging trails or roads on the contour. Because of the steepness of slope the use of ordinary equipment for woodland management and harvesting is hazardous. Special equipment can be used, but with caution. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is Vle.

730B—Nodaway-Cantril complex, 2 to 5 percent slopes. This complex consists of gently sloping soils on narrow stream bottoms and narrow foot slopes. It is about 60 percent Nodaway silt loam and 30 percent Cantril loam. The drainageways receive runoff from the higher areas, and some areas are subject to flooding. The moderately well drained, less sloping Nodaway soil is on the central part of the area along the drainageways, and the somewhat poorly drained Cantril soil is on the outer part of narrow foot slopes adjacent to the steeper slopes. Areas of this complex are long and narrow in shape and range from 5 to 100 acres or more. The individual areas of the Nodaway and Cantril soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Nodaway soil is very dark gray silt loam about 7 inches thick. The substratum to a depth of 60 inches or more is stratified brown, very dark grayish brown, and grayish brown silt loam.

Typically, the surface layer of the Cantril soil is very dark grayish brown loam about 8 inches thick. The subsurface layer, about 5 inches thick, is dark grayish brown loam. The subsoil is about 44 inches thick. The upper part is grayish brown and dark yellowish brown, mottled, friable loam, and the lower part is dark grayish brown, mottled, friable clay loam. The substratum to a depth of 60 inches or more is dark grayish brown, mottled clay loam. In some places on the narrow foot slopes, there are small areas where the subsurface layer is very dark grayish brown loam and extends to a depth of about 14 inches.

Included with these soils in mapping and making up 10 percent of the map unit are small areas of Colo and Vesser soils. Vesser soils are on the relatively higher part of the narrow bottom land with the Nodaway soil, and Colo soils are in depressions. Colo and Vesser soils are more poorly drained than the Nodaway soil. In some areas of urban construction these soils have been disturbed by excavation, and 5 feet or more of fill has been added.

The permeability of the Cantril and Nodaway soils is moderate. The available water capacity is high in the Cantril soil and very high in the Nodaway soil. Runoff is slow or medium. These soils have a seasonal high water table. Except where limed, the Cantril soil is slightly acid in the surface layer, and it is strongly acid in the subsoil. The Nodaway soil is neutral throughout. The surface layer of both soils contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil of the Cantril soil is low in available phosphorus and available potassium, and the substratum of the Nodaway soil is medium in available phosphorus and available potassium.

These soils are used mainly for pasture, hay, and woodland wildlife habitat. They are moderately suited to corn, soybeans, and small grains; well suited to grasses and legumes for hay and pasture; and moderately suited to trees. These soils are well suited to openland wildlife habitat and woodland wildlife habitat. The narrow bottom lands adjacent to the steeper side slopes are subject to flooding by runoff from the higher areas and from the stream channel. Where row crops are planted, diversion terraces can be used for protection from runoff.

If these soils are used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees, and a few areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is llw.

731C2—Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, somewhat poorly drained or moderately well drained soil is on convex ridgetops and short, convex side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 80 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown subsoil material into the surface layer. The subsoil is about 45 inches thick. The upper part is brown, mottled, firm silty clay loam; the middle part is dark grayish brown and grayish brown, mottled, very firm silty clay; and the lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Armstrong and Rinda soils on the lower part of the side slopes. Seepy areas occur in these soils during wet periods.

This soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is

high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for hay, pasture, and cultivated crops. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. This soil generally needs more nitrogen than the less eroded Pershing soil and requires greater production inputs to maintain higher yields and to maintain or improve tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

732C2—Weller silty clay loam, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops, convex side slopes, and in coves at the head of drainageways in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 10 to 100 acres or more.

Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of brown, silty clay subsoil material into the surface layer. The subsoil is about 46 inches thick. The upper part is brown, mottled, very firm silty clay; the middle part is brown silty clay loam; and the lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, severely eroded areas the surface layer is mostly brown silty clay. In some places the soil has been disturbed by excavation for streets and buildings (fig. 13).

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of the side slopes. Ashgrove soils are grayer and have more clay than the Weller soil, and Keswick soils have more sand. Seepy areas occur in these soils during wet periods. Also included are areas on the lower part of side slopes, where the lower part of the subsoil is brown clay loam or clay with more than 20 percent sand.

This Weller soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is generally difficult to till except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, and cultivated crops. It is moderately suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion, but row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Also intensive use for row crops will cause the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other such mechanical equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. This soil generally needs more nitrogen than the less eroded Weller soils and requires greater production inputs to maintain higher yields and to maintain or improve tilth.

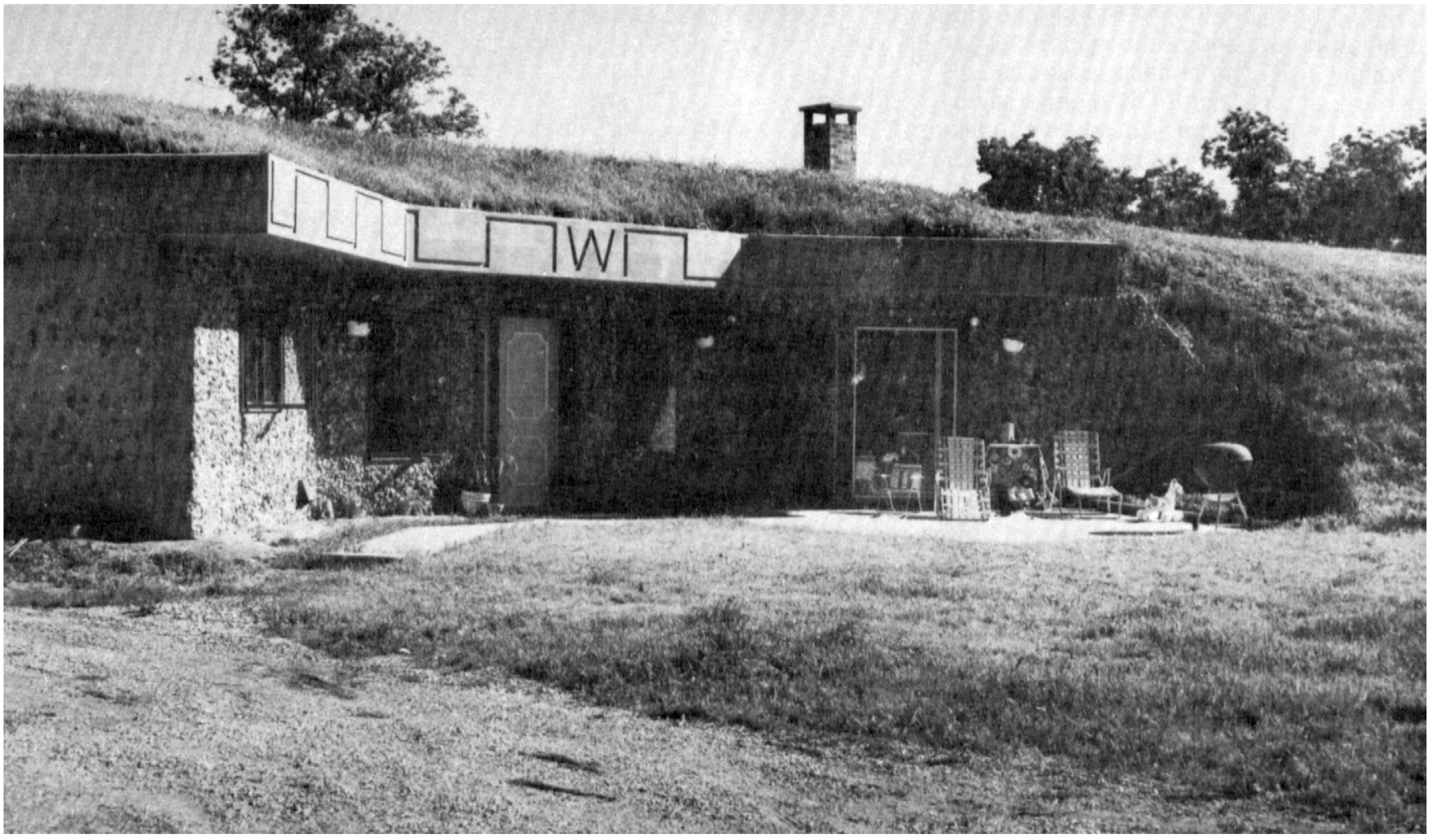


Figure 13.—This house with a sod roof was built into a side slope of Weller silty clay loam, 5 to 9 percent slopes, moderately eroded.

The use of this soil for pasture or hay is effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

732D2—Weller silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on convex side slopes in the loess-covered uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silty clay loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay subsoil material into the surface layer. The subsoil is about 45 inches thick. The upper part is brown, mottled, very firm silty clay; the middle part is brown, mottled, firm silty clay loam; and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. In some small, severely eroded areas the surface layer is mostly brown silty clay.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Ashgrove and Keswick soils on the lower part of side slopes. Ashgrove soils are grayer and have more clay than the Weller soil, and Keswick soils have more sand. Seepy areas occur in these soils during wet periods.

This Weller soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in

unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. Also, if it is used intensively for row crops, the plow layer tends to puddle readily after rains and to form a crust as it dries. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, and cultivated crops. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and grasses and legumes for hay and pasture. The tillage of row crops creates a very severe hazard of erosion, but row crops can be grown some of the time if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, can all reduce erosion. In some places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility and helps to maintain tilth. This soil generally needs more nitrogen than the less eroded Weller soil and requires greater production inputs to maintain higher yields and to maintain or improve tilth.

The use of this soil for pasture or hay is effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

764B—Grundy silt loam, benches, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to broad flats on convex ridgetops and the upper part of side slopes on the high, loess-covered benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 40 acres or more.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer, about 7 inches thick, is very dark gray silty clay loam. The subsoil is about 36 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is grayish brown and olive gray, mottled, firm silty clay loam; and the lower part is olive gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 9 feet. In some small, moderately eroded areas, some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Haig soils on the less sloping part of the map unit. Haig soils are more poorly drained than the Grundy soil.

This Grundy soil has slow permeability. The available water capacity is high, and runoff is slow or medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low or low in available phosphorus and low or medium in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. If this soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. This soil tends to warm more slowly in the spring than more permeable soils, and it dries more slowly after rains. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

779—Kalona silty clay loam, 0 to 1 percent slopes. This level, poorly drained soil is on broad flats on the loess-covered upland divides. Areas are irregular in shape and range from 20 to 500 acres or more.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer, about 7 inches thick, is black and very dark gray silty clay loam. The subsoil is about 27 inches thick. The upper part is dark gray, mottled, firm silty clay loam; the middle part is gray and olive gray, mottled, firm silty clay loam; and the lower part is light olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light olive gray, mottled silt loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Sperry and Taintor soils. Sperry soils are in shallow depressions and Taintor soils are on the higher part of this unit. Sperry soils are more slowly permeable, are more poorly drained, and are more difficult to drain than the Kalona soil. Taintor soils have less clay in the surface layer and are easier to plow.

This Kalona soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer and subsoil is neutral. The heavy silty clay loam surface layer contains 4.5 to 6.0 percent organic matter. The surface layer is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become very hard and cloddy when dry. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown most of the time on this soil if adequate drainage can be provided. Drainage is needed to reduce wetness and to provide proper aeration and a deep root zone. Tile drains function satisfactorily, but where there are wide areas of this soil, outlets are a problem. In some depressed areas, surface drains are needed to supplement tile drainage. This soil warms more slowly in spring than better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and tilling only when the soil is not wet help maintain good tilth. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The land capability classification is IIw.

792D2—Armstrong clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained or somewhat poorly drained soil is on short, convex side slopes; on narrow, convex ridgetops; and on convex nose slopes in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 80 acres or more.

Typically, the surface layer is very dark grayish brown clay loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown clay subsoil material into the surface layer. The subsoil is more than 52 inches thick. The upper part is brown, very firm clay with dark reddish brown, yellowish red, and dark red mottles, and the lower part is strong brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly dark brown clay loam. In other small, uneroded areas the surface layer is very dark grayish brown loam about 8 inches thick, and the subsurface layer is dark grayish brown loam about 4 inches thick. In some places, the soil has been disturbed by excavation for streets and buildings.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Gara, Ladoga, Pershing, and Rinda soils. Gara soils are on the lower part of side slopes, and Ladoga, Pershing, and Rinda soils are on the upper part. Gara soils are better drained than the Armstrong soil. Ladoga and Pershing soils contain less sand, and Rinda soils are more poorly drained.

This Armstrong soil has slow permeability. The available water capacity is high, and runoff is rapid. This soil has a seasonal high water table and seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains about 1 to 2 percent organic matter. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for hay, pasture, and row crops. It is poorly suited to corn, soybeans, and small grains, and it is moderately suited to trees and to grasses and legumes for hay and pasture. The tillage of row crops creates a very severe hazard of erosion, but row crops can be grown some of the time on this soil if adequate protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Pasture management on this seepy soil can be difficult in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing,

and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

795D2—Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded. This strongly sloping, poorly drained soil is on short, convex side slopes, convex nose slopes, and in coves at the upper end of drainageways in the uplands. Areas are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is dark grayish brown silty clay loam about 5 inches thick. Generally, plowing has mixed some streaks and pockets of grayish brown and brown subsoil material into the surface layer. The subsoil is more than 55 inches thick. The upper part is brown and grayish brown, mottled, firm silty clay loam; the middle part is brown and grayish brown, mottled, very firm silty clay and clay; and the lower part is gray, mottled, very firm clay grading with depth to light olive gray, mottled, very firm clay. In some small, severely eroded areas the surface layer is mostly grayish brown silty clay loam. In some small, uneroded areas the surface layer is dark grayish brown silty clay loam about 9 inches thick.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Keswick and Weller soils. Keswick soils are on the lower part of side slopes, and Weller soils are on the upper part. Keswick and Weller soils are better drained than the Ashgrove soil.

This Ashgrove soil has very slow permeability. The available water capacity is moderate, and runoff is rapid. This soil has a seasonal high water table. It has seepy spots during wet periods. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. The surface layer is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. Also, if the soil is used intensively for row crops, the plow layer tends to puddle readily after rains and to form a crust as it dries. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, and row crops. It is poorly suited to corn, soybeans, small grains, and trees, and it is moderately suited to poorly suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, wetness is a severe limitation and erosion is a very severe hazard. In many places, this soil has a narrow, wet, seepy band at the upper part of the slope that commonly remains wet until midsummer. This soil warms slowly in spring and dries very slowly after rains. In wet years, planting is delayed. Tile drainage is not feasible on this very slowly permeable soil, but interceptor tile can be placed upslope in the adjacent soil. Row crops can be grown some of the time on this soil if adequate erosion protection and adequate drainage is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content on this soil. Pasture management on this seepy soil is difficult particularly in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of equipment will need to be restricted to drier periods or to the winter months when the ground is frozen. Special high flotation equipment may also be used if harvesting or management is necessary during wet periods. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

831C2—Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained or somewhat poorly drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Individual areas are irregular in shape and commonly range from 5 to 10 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown subsoil material into the surface layer. The subsoil is about 44 inches thick. The upper part is brown, mottled, firm silty

clay loam; the middle part is dark grayish brown and grayish brown, mottled, very firm silty clay; and the lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay loam.

This Pershing soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for hay, pasture, and cultivated crops. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material helps to increase fertility and maintain better tilth. This soil generally needs more nitrogen than the less eroded Pershing soils and requires greater production inputs to maintain higher yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of the soil. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

832C2—Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Individual areas are elongated, narrow, and irregular in shape and commonly range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay subsoil material into the surface layer. The subsoil is about 44 inches thick. The upper part is brown, mottled, very firm silty clay; the middle part is brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay.

This Weller soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas; and reaction in the subsoil is very strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become hard and cloddy when dry. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, and cultivated crops. It is moderately suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a hazard of erosion, but row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Also, intensive use for row crops will cause the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other such mechanical implement can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility and maintains tilth. This soil generally needs more nitrogen than the less eroded Weller soils and

requires greater production inputs to maintain higher yields and to maintain or improve tilth.

The use of this soil for pasture or hay is effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Permanent pastures can be improved by renovating or reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees. Planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

876B—Ladoga silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is dark grayish brown silt loam. The subsoil is about 46 inches thick. The upper part is brown, friable silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 7 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Givin soils that are underlain by stratified loamy alluvium at a depth of about 7 feet. Givin soils are on the less sloping part of this unit and are more poorly drained than the Ladoga soil.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter and is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a moderate hazard of erosion, but row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

876C2—Ladoga silt loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 44 inches thick. The upper part is brown, friable silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silt loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some small, uneroded areas there is a dark grayish brown silt loam subsurface layer about 4 inches thick.

This Ladoga soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter and is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion, but

row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Ladoga soils and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. There should be no problems in planting new stands of trees if proper species are selected and managed properly.

The land capability classification is IIIe.

880B—Clinton silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 10 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer, about 5 inches thick, is brown silt loam. The subsoil is more than 48 inches thick. The upper part is dark yellowish brown, friable silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Keomah soils that are more poorly drained than the Clinton soil. These Keomah soils are on the less sloping part of this map unit.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter and is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. Row crops can be grown much of the time on this soil, but there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems encountered in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

880C—Clinton silt loam, benches, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsurface layer, about 10 inches thick, is brown silt loam. The subsoil is more than 46 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Douds and

Galland soils on the lower part of side slopes. Douds and Galland soils contain more sand than the Clinton soil.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil commonly is strongly acid. The surface layer contains 1 to 2 percent organic matter and is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, pasture, and woodland. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and a few small areas remain in native hardwoods. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIIe.

880C2—Clinton silt loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 50 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 37 inches thick. The upper part is brown, firm silty clay loam; the middle part is dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay loam.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Douds and Galland soils on the lower part of side slopes. These soils contain more sand than the Clinton soil.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil commonly is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter and is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion, but row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Clinton soil and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes

surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Hardwood seedlings, however, apparently require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods to eroded or formerly cultivated soils. Planted seedlings survive and grow well if species are selected and managed properly.

The land capability classification is IIIe.

880D2—Clinton silt loam, benches, 9 to 14 percent slopes, moderately eroded. This strongly sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown silty clay loam subsoil material into the surface layer. The subsoil is about 45 inches thick. The upper part is brown, friable silty clay loam; the middle part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and grayish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is grayish brown and yellowish brown, mottled silt loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some small, uneroded areas there is a brown silt loam subsurface layer about 4 inches thick.

Included with this soil in mapping and making up 5 to 15 percent of the map unit are small areas of Douds and Galland soils on the lower part of side slopes. These soils contain more sand than the Clinton soil.

This Clinton soil has moderately slow permeability. The available water capacity is high, and runoff is rapid. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 0.5 to 1.5 percent organic matter. It is friable and easily tilled. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a very severe hazard of erosion, but row crops can be grown some of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but has less effect on growth if seedlings have already emerged. This crust is less noticeable in areas where a meadow crop is included in the rotation. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Clinton soil and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Hardwood seedlings, however, apparently require a site of better quality and grow more satisfactorily if planted on uncultivated soils. Conifers are better suited than hardwoods to eroded or formerly cultivated soils. Planted seedlings survive and grow well if species are selected and managed properly.

The land capability classification is IIIe.

881B—Otley silty clay loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 10 acres or more.

Typically, the surface layer is very dark brown silty clay loam about 9 inches thick. The subsurface layer, about 9 inches thick, is very dark brown and very dark grayish brown, friable silty clay loam. The subsoil is about 38 inches thick. The upper part is brown, friable silty clay loam; the middle part is brown and dark yellowish brown, firm silty clay loam; and the lower part is yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is yellowish brown and grayish brown, mottled silty clay loam. Brown, loamy, stratified alluvium is at a depth of about 7 feet. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Mahaska soils on the less sloping part of the map unit. Mahaska soils are more poorly drained than the Otley soil.

This Otley soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 3 to 4 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for row crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is well suited to trees. If the soil is used for cultivated crops, there is a moderate hazard of erosion, but row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

881C2—Otley silty clay loam, benches, 5 to 9 percent slopes, moderately eroded. This moderately sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 30 acres or more.

Typically, the surface layer is very dark brown silty clay loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown subsoil material into the surface layer. The subsoil is more than 53 inches thick. The upper part is brown, firm silty clay loam, and the lower part is yellowish brown and grayish brown, mottled, friable silty clay loam. Brown, loamy, stratified alluvium is at a depth of about 7 feet. In some small, severely eroded areas the surface layer is mostly brown silty clay loam. In some uneroded areas there is a very dark grayish brown silty clay loam subsurface layer about 7 inches thick.

This Otley soil has moderate permeability. The available water capacity is high, and runoff is medium. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. It is friable and easily tilled. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is well suited to trees and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a severe hazard of erosion, but row crops can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration. This soil generally needs more nitrogen than the less eroded Otley soils and requires greater production inputs to maintain high yields and to maintain or improve tilth.

The use of this soil for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of this soil. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

The land capability classification is IIIe.

977—Richwood silt loam, 0 to 2 percent slopes. This nearly level, well drained soil is on very low stream terraces. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 9 inches thick, is very dark grayish brown silt loam. The subsoil is more than 44 inches thick. The upper part is dark brown, friable silt loam; the middle part is brown, friable silt loam; and the lower part is brown, friable loam and sandy loam. In places, the soil has a silty clay loam surface layer and subsoil. In other places, the surface layer is loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Nevin soils. Nevin soils are on the less sloping part of the unit. Nevin soils are more poorly drained than the Richwood soil.

This Richwood soil has moderate permeabiity. The available water capacity is high, and runoff is slow. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 2.5 to 3.5 percent organic matter. It is friable and easily tilled. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, small grains, trees, and grasses and legumes for hay and pasture. Row crops can be grown most of the time. Drainage generally is adequate on this well drained soil.

This soil is seldom used for pasture or hay. If it is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is I.

977B—Richwood silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on low stream terraces. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The subsurface layer is very dark grayish brown silt loam about 4 inches thick. The subsoil is about 29 inches thick. The upper part is dark brown, friable silt loam, and the lower part is dark yellowish brown, friable silt loam. The substratum to a depth of about 60 inches is stratified brown and dark yellowish brown silt loam and sandy loam. In some places the soil has a silty clay loam surface layer and subsoil. In other places, the surface layer is loam.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Nevin soils on the upper part of side slopes. Nevin soils are more poorly drained than the Richwood soil.

This Richwood soil has moderate permeability. The available water capacity is high, and runoff is medium. The reaction in the surface layer is slightly acid in unlimed areas, and the reaction in the subsoil is medium acid. The surface layer contains 2 to 3 percent organic matter and is friable and easily tilled. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. This soil is well suited to corn, soybeans, and small grains and to trees and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. Conservation tillage is effective in helping to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

993D2—Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded. This complex consists of strongly sloping, well drained to somewhat poorly drained soils on short, convex side slopes; on narrow, convex ridgetops; and on convex nose slopes in the uplands. It is about 60 percent Gara loam and about 30 percent Armstrong loam. The well drained to moderately well drained Gara soil is on the lower part of the side slopes, and the moderately well drained to somewhat poorly drained Armstrong soil is on the upper part. Areas of this complex are elongated, narrow, and irregular in shape and range from 10 to 50 acres or more. The individual areas of the Gara and Armstrong soils are so intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Gara soil is very dark grayish brown loam about 7 inches thick. Where the soil has been plowed, there are streaks and pockets of brown clay loam subsoil material in the surface layer. The subsoil is about 41 inches thick. The upper part is brown, friable clay loam; the middle part is dark yellowish brown, firm clay loam; and the lower part is yellowish brown, mottled clay loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled clay loam. In some small, severely eroded areas the surface layer is mostly brown clay loam. In some small, uneroded areas the surface layer is very dark grayish brown loam about 9 inches thick and there is a dark grayish brown loam subsurface layer about 4 inches thick.

Typically, the surface layer of the Armstrong soil is very dark grayish brown loam about 7 inches thick. Generally, plowing has mixed some streaks and pockets of brown clay subsoil material into the surface layer. The subsoil is more than 53 inches thick. The upper part is brown, very firm clay with dark reddish brown and yellowish red mottles; the middle part is strong brown, firm clay loam with dark reddish brown and yellowish red mottles; and the lower part is yellowish brown and grayish brown, mottled, firm clay loam. In some small, severely eroded areas the surface layer is mostly brown clay with dark reddish brown and yellowish red mottles. In some small, uneroded areas the surface layer is very dark grayish brown loam about 8 inches thick and the subsurface layer is dark grayish brown loam about 3 inches thick.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Ladoga, Pershing, and Rinda soils on the upper part of side slopes near the Armstrong soil. Ladoga and Pershing soils contain less sand than the Armstrong soil, and Rinda soils typically contain more clay and are more poorly drained.

The Gara soil has moderately slow permeability, and the Armstrong soil has slow permeability. The available water capacity in both soils is high, and runoff is rapid. The shrink-swell potential is high in the Armstrong soil. The Armstrong soil has a seasonal high water table and

has seepy spots during wet periods. Reaction in the surface layer of both soils is medium acid in unlimed areas, and reaction in the subsoil is strongly acid in the Gara soil and medium acid in the Armstrong soil. The surface layer of both soils contains 1 to 3 percent organic matter. The subsoil of these soils is low or very low in available phosphorus and very low in available potassium.

These soils are used mainly for pasture, hay, and row crops. They are poorly suited to corn, soybeans, and small grains, and they are moderately suited to trees and grasses and legumes for hay and pasture. Tillage for row crops creates a very severe hazard of erosion. Row crops can be grown some of the time on these soils if adequate erosion protection is provided. Conservation practices, such as terracing, farming on the contour, and conservation tillage, a practice that leaves crop residue on the surface throughout the year, all reduce erosion. In some places such erosion control practices as contouring and terraces are difficult because of undulating topography and short slopes. Where terracing is used on the upper part of side slopes on the Armstrong soil, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Where terracing is used on the lower part of slopes on the Gara soil, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of these soils for pasture or hay is also effective in controlling erosion. Improved permanent pastures slowly increase the organic matter content of these soils. Pasture management on the seepy, upper part of slopes can be difficult particularly in the spring and early summer. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soils are wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

These soils are moderately suited to trees. If these soils are planted to trees, the seedlings in areas of the Gara soil should survive well if species are selected and managed properly. Planted seedlings in areas of the Armstrong soil will not survive well unless they are planted closely together and thinned later to achieve the desired stand density. In areas of the Armstrong soil, the use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IVe.

1057—Rushville silt loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on high, loess-covered stream benches. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer, about 9 inches thick, is gray and light brownish gray silt loam. The subsoil is about 37 inches thick. The upper part is grayish brown, mottled, very firm silty clay, and the lower part is grayish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 8 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Keomah soils in the more sloping part of the map unit. Keomah soils are better drained than the Rushville soil.

This Rushville soil has slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for row crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains. It is well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown some of the time on this soil if adequate drainage can be provided. In some places, tile drains function satisfactorily on this slowly permeable soil, but in other places they do not. Open ditches, surface drainage, land shaping, and bedding are all used to remove surface water. In years when rainfall is heavy, planting is delayed. Intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings, but it has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other such mechanical equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. It is poorly drained. The use of equipment will need to be restricted to drier

periods or to the winter months when the ground is frozen. Special high flotation equipment may be used if harvesting or management is necessary during wet periods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIw.

1122—Sperry silt loam, benches, 0 to 1 percent slopes. This level, very poorly drained or poorly drained soil is in slight depressions on moderately broad flats on high, loess-covered stream benches. This soil receives runoff from the higher areas and is subject to ponding. Individual areas are irregular in shape and range from 4 to 20 acres or more.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer is dark gray silt loam about 6 inches thick. The subsoil is about 36 inches thick. The upper part is dark gray, mottled, very firm silty clay, and the lower part is gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 8 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Taintor soils that are in the higher areas between the depressions. Taintor soils have more clay in the surface layer than the Sperry soil and are easier to drain.

This Sperry soil has slow permeability. The available water capacity is high, and runoff is very slow or ponded. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is moderately suited to corn, soybeans, and small grains, and it is moderately suited to well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. This soil receives runoff from adjacent upland slopes. In many places, diversion terraces can be used for protection against runoff from the higher areas. Row crops can be grown much of the time on this soil if adequate drainage and protection from runoff can be provided. Tile drains generally are not very satisfactory on this slowly permeable soil. In places, surface drains can be used to remove excess water. This soil warms slowly in the spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. This soil is fairly difficult to manage and requires timely farming operations. An occasional year of meadow improves tilth and helps to control weeds and insects. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is IIIw.

1130—Belinda silt loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on narrow to moderately broad flats on high, loess-covered stream benches. Individual areas are irregular in shape and commonly range from 5 to 20 acres or more.

Typically, the surface layer is very dark gray silt loam about 9 inches thick. The subsurface layer is dark gray silt loam grading with depth to grayish brown silt loam. It is about 8 inches thick. The subsoil is over 43 inches thick. The upper part is dark grayish brown, mottled, very firm silty clay; the middle part is grayish brown, mottled, very firm silty clay; and the lower part is olive gray and light olive gray, mottled, firm silty clay loam. Stratified, loamy alluvium is at a depth of about 7 feet. In some small areas the very dark gray surface layer is silt loam about 10 to 12 inches thick or less than 6 inches thick.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Pershing soils on the more sloping part of the unit. Pershing soils are better drained than the Belinda soil.

This Belinda soil has very slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 2 to 3 percent organic matter. The surface layer is friable and easily tilled under optimum moisture conditions, but in the spring, it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, and small grains, and it is moderately suited to well suited to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage is provided, but tile drains generally are not very satisfactory on this very slowly permeable soil. Open ditches, surface drainage, land shaping, and bedding are all used to remove surface water. This soil warms slowly in the spring and dries slowly after rains. In years when rainfall is heavy, planting is delayed. Because this soil is fairly difficult to manage, farming operations need to be timely. An occasional year of meadow improves tilth and helps to control weeds and insects. If used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is poorly suited to trees. If areas of this poorly drained soil are planted to trees, the use of equipment will need to be restricted to drier times of the year or during winter months when the ground is frozen. Planted seedlings do not survive well. They can be planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIw.

1131B—Pershing silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained or somewhat poorly drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Individual areas are irregular in shape and commonly range from 5 to 20 acres or more.

Typically, the surface layer is very dark gray silt loam about 7 inches thick. The subsurface layer is dark grayish brown silt loam about 4 inches thick. The subsoil is over 49 inches thick. The upper part is yellowish brown and dark grayish brown, friable silty clay loam; the middle part is dark grayish brown and grayish brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam grading with depth to friable silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Belinda soils on the less sloping part of the map unit. Belinda soils are more poorly drained than the Pershing soil.

This Pershing soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains about 2 to 3 percent organic matter. It is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is high in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is moderately suited to corn, soybeans, small grains, and trees; and it is well suited to grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is a hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Returning crop residue to the soil or the regular addition of other organic material increases fertility and maintains tilth.

The use of the soil for pasture or hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

1132B—Weller silt loam, benches, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on convex ridgetops and convex side slopes on high, loess-covered stream benches. Individual areas are irregular in shape and commonly range from 5 to 30 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is over 48 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm and friable silty clay loam. Stratified, loamy alluvium is at a depth of about 6 feet. In some small, moderately eroded areas some of the subsoil is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Beckwith soils on the less sloping part of the map unit. Beckwith soils are more poorly drained than the Weller soil.

This Weller soil has slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is strongly acid in unlimed areas, and reaction in the subsoil is very strongly acid. The surface layer contains about 1 to 2 percent organic matter. It is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for pasture, hay, cultivated crops, and woodland. It is moderately suited to corn, soybeans, small grains, and trees, and it is well suited to grasses and legumes for hay and pasture. If the soil is

used for cultivated crops, there is a hazard of erosion. Row crops, however, can be grown much of the time if adequate erosion protection is provided. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help to prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used cuts should be held to a minimum depth to prevent exposure of the clayey subsoil. Seepage water can occur in the terrace channels. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as the soil dries. This crust retards the emergence of seedlings but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other such mechanical implement can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material helps to increase fertility and maintain or improve tilth.

The use of this soil for pasture and hay is also effective in controlling erosion. Permanent pastures can be improved by renovating and reseeding. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

This soil is moderately suited to trees, and a few small areas remain in native hardwoods. Natural and planted seedlings do not survive well unless they are planted closely together and thinned later to achieve the desired stand density. The use of artificial drainage to lower the water table can reduce the hazard of windthrow.

The land capability classification is IIIe.

1133—Colo silty clay loam, channeled, 0 to 2 percent slopes. This nearly level, poorly drained soil is on bottom lands adjacent to meandering stream channels along the major streams in the county. Slopes typically are undulating. This Colo soil is dissected by many old stream channels, some of which are filled with water a good part of the time. This soil is subject to flooding. Individual areas are long and narrow in shape and commonly range from 10 to 80 acres or more.

Typically, the surface layer is very dark gray silty clay loam about 5 inches thick. The subsurface layer, extending to a depth of about 50 inches, is black silty clay loam in the upper part and very dark gray silty clay loam in the lower part. The substratum to a depth of about 60 inches or more is dark gray silty clay loam. In places, the surface layer is silt loam.

Included with this soil in mapping and making up 10 to 15 percent of the map unit are small areas of Klum and Nodaway soils and soils that have a silty clay subsoil. Klum soils have more sand than the Colo soil, and both Klum and Nodaway soils have less clay and are better drained. The soils with a silty clay subsoil are more difficult to drain. Klum and Nodaway soils are near the stream channels. The soils with a silty clay subsoil are in shallow depressions and along drainageways.

This Colo soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is neutral, and reaction in the thick subsurface layer commonly is neutral or slightly acid. The lower part of this subsurface layer typically is medium in available phosphorus and very low in available potassium. The surface layer contains 4 to 5 percent organic matter.

This soil is used mainly for pasture, hay, woodland, and wildlife. It is generally not suited to corn, soybeans, and small grains, and it is moderately suited to grasses and legumes for hay and pasture. It is poorly suited to trees. It is moderately suited to openland and woodland wildlife habitat.

This soil is generally not suited to row crops, because it is subject to frequent flooding. It is better suited to other uses, such as pastures. Permanent pastures can be improved by renovating and reseeding. Once the permanent pasture has been established, overgrazing or grazing when the soil is too wet causes surface compaction and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and, especially, restricted use during wet periods are essential to keep the pasture and soil in good condition.

The land capability classification is Vw.

1180B—Keomah silt loam, benches, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on convex ridgetops and the upper part of side slopes on high, loess-covered stream benches. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer, about 4 inches thick, is grayish brown silt loam. The subsoil is about 44 inches thick. The upper part is dark yellowish brown, mottled, friable silty clay loam; the middle part is yellowish brown and grayish brown, mottled, firm silty clay loam; and the lower part is light brownish gray, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. Stratified, loamy alluvium is at a depth of about 7 feet. In places the slopes are less than 2 percent.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of moderately

well drained Clinton soils on the more sloping part of the map unit.

This Keomah soil has moderately slow permeability. The available water capacity is high, and runoff is medium. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is strongly acid. The surface layer contains 1 to 2 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops, hay, and pasture. It is well suited to corn, soybeans, and small grains. It is well suited to grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time on this soil, but there is a moderate hazard of erosion. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Where terracing is used, cuts should be held to a minimum depth to prevent exposure of the less productive subsoil. Also, intensive use for row crops causes the surface layer to puddle readily after rains and to form a crust as it dries. This crust retards the emergence of seedlings, but has less effect on crop growth if seedlings have already emerged. In areas where a meadow crop is included in the rotation, this crust is less noticeable. A rotary hoe or other equipment can be used to break the crust. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. There should be no problems in planting new stands of trees if species are selected and managed properly.

The land capability classification is IIe.

1279—Taintor silty clay loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on moderately broad flats on high, loess-covered stream benches. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is black silty clay loam about 10 inches thick. The subsurface layer, about 10 inches thick, is black silty clay loam. The subsoil is about 36 inches thick. The upper part is very dark gray and dark gray, firm silty clay; the middle part is olive gray and light olive gray, mottled, firm silty clay; the lower part is gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is gray, mottled silty clay loam. Gray, loamy, stratified alluvium is at a depth of about 8 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Colo, Mahaska, and Sperry soils. Colo soils are along drainageways. Mahaska soils are on the more sloping part of the map unit, and Sperry soils are in depressions. Colo soils are more poorly drained than the Taintor soil, Mahaska soils are better drained, and Sperry soils are more slowly permeable and are more poorly drained. Sperry soils are more difficult to drain.

This Taintor soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is slightly acid in unlimed areas, and reaction in the subsoil is slightly acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is easily tilled under optimum moisture conditions, but if worked when wet, it is likely to become hard and cloddy when dry. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time on this soil if adequate drainage is provided. Drainage is needed to reduce wetness and to provide proper aeration and a deep root zone for plants. Tile drains function satisfactorily in this soil. This poorly drained soil tends to warm more slowly in the spring than better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and avoiding tilling the soil when it is wet help maintain good tilth. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The land capability classification is IIw.

1280—Mahaska silty clay loam, benches, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on narrow flats and on the edges of moderately broad flats on high, loess-covered stream benches. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is black silty clay loam about 9 inches thick. The subsurface layer, about 4 inches thick, is very dark grayish brown silty clay loam. The subsoil is about 37 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam; the lower part is grayish brown and yellowish brown, mottled, friable silty clay loam. The substratum to a depth of 60 inches or more is grayish brown and yellowish brown, mottled silty clay loam. Grayish brown loam, stratified alluvium is at a depth of about 8 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Otley, Sperry, and Taintor soils. Otley soils are on the more sloping parts of this map unit. Sperry soils are in depressions. Taintor soils are on small flats. Otley soils are better drained than the Mahaska soil. Sperry and Taintor soils are more poorly drained, and Sperry soils are more difficult to drain.

This Mahaska soil has moderate permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is moderately suited to trees. Row crops can be grown much of the time on this soil. Drainage generally is adequate on this somewhat poorly drained soil, but in wet years tile drains may facilitate timely field operations in some low areas.

In some places, this soil is used for pasture or hay. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is I.

1280B—Mahaska silty clay loam, benches, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is adjacent to moderately broad flats on convex side slopes on high, loess-covered stream benches. Areas are elongated, narrow, and irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer, about 6 inches thick, is black silty clay loam. The subsoil is about 38 inches thick. The upper part is very dark grayish brown, mottled, friable silty clay loam; the middle part is dark grayish brown, mottled, firm silty clay loam; and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled silty clay loam. Brown, loamy, stratified alluvium is at a depth of about 7 1/2 feet. In some small areas the subsurface layer extends to a depth of more than 24 inches.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Otley soils on the more sloping part of the unit. Otley soils are better drained than the Mahaska soil.

This Mahaska soil has moderate permeability. The available water capacity is high, and runoff is slow or medium. This soil has a seasonal high water table. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3.5 to 5.0 percent organic matter. It is friable and easily tilled. The subsoil is medium in available phosphorus and very low in available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is moderately suited to trees. If the soil is used for cultivated crops, there is a moderate hazard of erosion. Row crops can be grown most of the time if adequate erosion protection is provided. This soil is also wet at the head of drainageways, and in these areas field operations are more timely if tile drains are used. Conservation tillage, a practice that leaves crop residue on the surface throughout the year, is effective in helping to prevent excessive soil loss. Grassed waterways help prevent gully erosion. In most places, such erosion control practices as contouring and terracing are difficult because of undulating topography and short slopes. Returning crop residue to the soil or the regular addition of other organic material increases fertility, helps to maintain tilth, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, increases runoff, and results in poor tilth.

The land capability classification is IIe.

1315—Klum-Perks-Nodaway complex, channeled, 1 to 3 percent slopes. This complex consists of very gently sloping soils on undulating flood plains adjacent to meandering major streams. About 40 percent of this complex is moderately well drained Klum fine sandy loam, about 30 percent is excessively drained Perks loamy sand, and about 20 percent is moderately well drained Nodaway silt loam. These soils are subject to flooding and are dissected by many old stream channels that are filled with water a good part of the time. The Klum and Nodaway soils occupy the outer part of the areas, and the Perks soil occupies the central part along the drainageways and old stream channels. Areas of this complex are long and narrow and range from 10 to 100 acres or more. The areas of the Klum, Perks, and Nodaway soils are so closely intermingled or so small that they could not be shown separately at the scale selected for mapping.

Typically, the surface layer of the Klum soil is very dark grayish brown fine sandy loam about 9 inches thick. The substratum is stratified very dark grayish brown fine sandy loam in the upper part and stratified brown, dark brown, and dark grayish brown loamy fine sand, sand, and loamy sand in the lower part, to a depth of 60 inches or more.

Typically, the surface layer of the Perks soil is dark brown loamy sand about 7 inches thick. The substratum to a depth of 60 inches or more is stratified brown, dark brown, and yellowish brown loamy sand and sand.

Typically, the surface layer of the Nodaway soil is very dark grayish brown silt loam about 8 inches thick. The substratum to a depth of 60 inches or more is stratified dark grayish brown, very dark grayish brown, and grayish brown silt loam that contains thin strata of sandy loam, loam, and loamy sand below a depth of 42 inches.

Included with these soils in mapping and making up about 10 percent of the map unit are small areas of Colo soils in low areas, shallow depressions, and along drainageways near the Nodaway soil. Colo soils are more poorly drained and more difficult to drain than the Nodaway soil.

The permeability is moderately rapid in the Klum soil, rapid in the Perks soil, and moderate in the Nodaway soil. The available water capacity is low in the Klum soil, very low in the Perks soil, and very high in the Nodaway soil. The runoff from these soils is slow. The Klum and Nodaway soils have a seasonal high water table.

In unlimed areas, the surface layer of the Perks soil is medium acid, and that of the Klum and Nodaway soils is neutral. The organic matter content of the surface layer is 0.5 to 1.5 percent in the Klum soil, about 0.5 percent in the Perks soil, and 2.0 to 3.0 percent in the Nodaway soil. The substratum is very low in available phosphorus and potassium in the Klum and Perks soils and is medium in available phosphorus and potassium in the Nodaway soil.

These soils are used mostly for pasture, woodland, and wildlife habitat. They are generally not suited to corn, soybeans, and small grains, and they are moderately suited to poorly suited to grasses and legumes for hay and pasture. They are moderately suited to trees and to openland wildlife and woodland wildlife habitat. During wet periods, especially in the early spring, these soils are subject to flooding, and during dry periods they are droughty. Some areas are used for pasture or hay. Pasture management on these droughty soils can be difficult. Permanent pasture can be improved by renovating and reseeding. Once the permanent pasture has been established, restricted use during wet periods, proper stocking, pasture rotation, and timely deferment of grazing, especially during dry periods, are essential to keep the pasture and soil in good condition. Other areas are used for openland wildlife habitat and woodland wildlife habitat. Much of the vegetation in woodland areas is willows and shrubs.

These soils are moderately suited to trees. Natural and planted seedlings in areas of the Klum and Nodaway soils survive and grow well, but seedlings in areas of the Perks soil do not survive well. However, they can be planted closely together and thinned later to achieve the desired stand density. Except for frequent flooding, there are no other hazards or limitations.

The land capability classification is Vw.

1362—Haig silt loam, benches, 0 to 2 percent slopes. This nearly level, poorly drained soil is on broad flats on the high, loess-covered benches. Areas are irregular in shape and range from 10 to 40 acres or more.

Typically, the surface layer is black silt loam about 10 inches thick. The subsurface layer, about 9 inches thick, is black and very dark gray silty clay loam. The subsoil is about 38 inches thick. The upper part is very dark gray and dark gray, mottled, very firm silty clay; the middle part is olive gray, mottled, firm silty clay loam; and the lower part is light olive gray, mottled, friable silty clay loam. The substratum to a depth of about 60 inches or more is light olive gray, mottled silty clay loam. Stratified loamy alluvium is at a depth of about 9 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Grundy soils on the more sloping part of the unit. Grundy soils are better drained than the Haig soil.

This Haig soil has slow permeability. The available water capacity is high, and runoff is very slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer is medium acid in unlimed areas, and reaction in the subsoil is medium acid. The surface layer contains 3 to 4 percent organic matter. This soil is friable and easily tilled under optimum moisture conditions, but in the spring it tends to warm and dry more slowly than soils with less clay in the subsoil. The subsoil is low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown much of the time if adequate drainage can be provided. Drainage is needed to reduce wetness and to provide proper aeration and a deep root zone. Tile drains are not satisfactory in all areas of this slowly permeable soil, and surface drains are needed in depressions. Where there are wide areas of this soil, outlets are a problem. This soil tends to warm more slowly in the spring than more permeable and better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and avoiding tilling the soil when it is wet help to maintain good tilth. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

The land capability classification is IIw.

1779—Kalona silty clay loam, benches, 0 to 1 percent slopes. This level, poorly drained soil is on moderately broad flats on high, loess-covered stream benches. Areas are irregular in shape and range from 5 to 20 acres or more.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer, about 8 inches thick, is black silty clay. The subsoil is about 32 inches thick. The upper part is very dark grayish brown, mottled, firm silty clay; the middle part is dark grayish brown and olive gray, mottled, firm silty clay; and the

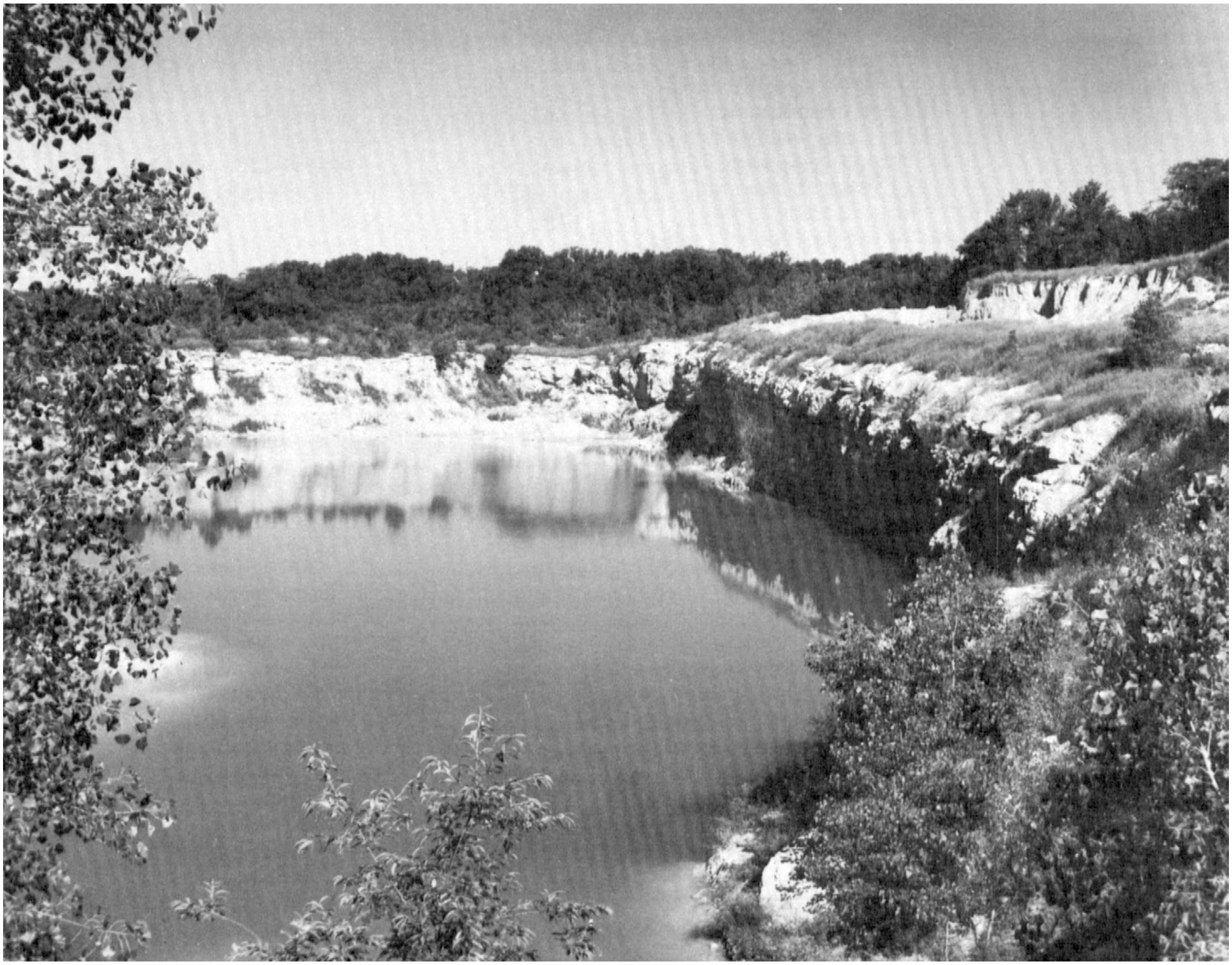


Figure 14.—Inactive limestone quarry.

lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is olive gray, mottled silty clay loam. Gray, loamy, stratified alluvium is at a depth of about 8 feet.

Included with this soil in mapping and making up 5 to 10 percent of the map unit are small areas of Sperry and Taintor soils. Sperry soils are in shallow depressions, and Taintor soils are on the more sloping part of this unit. Sperry soils are more slowly permeable than the Kalona soil and are more poorly drained and more difficult to drain. Taintor soils have less clay in the surface layer and are easier to till.

This soil has moderately slow permeability. The available water capacity is high, and runoff is slow. This soil has a seasonal high water table. The shrink-swell potential is high. Reaction in the surface layer and subsoil is neutral. The surface layer contains 4.5 to 6.0 percent organic matter and is generally difficult to till, except under optimum moisture conditions. If worked when wet, it is likely to become very hard and cloddy when dry. The subsoil is very low in available phosphorus and available potassium.

This soil is used mainly for cultivated crops. It is well suited to corn, soybeans, and small grains and to grasses and legumes for hay and pasture. It is poorly suited to trees. Row crops can be grown most of the time if adequate drainage is provided. Drainage is needed to reduce wetness and to provide proper

aeration and a deep root zone. Tile drains function satisfactorily except in depressed areas, where outlets are a problem and surface drains are needed. This soil warms more slowly in spring than the better drained soils, and it dries more slowly after rains. Returning crop residue to the soil and avoiding tilling the soil when it is wet help to maintain good tilth. If this soil is used for pasture, overgrazing or grazing when the soil is wet causes surface compaction and results in poor tilth.

The land capability classification is IIw.

5010—Pits, sand and gravel. This map unit consists of open pits from which sand and gravel have been removed. The pits range from 20 to 30 feet or more in depth. Many of the pits are still in operation. The areas are irregular in shape and range from 5 to 20 acres or more.

The soil materials are quite variable. In most places, permeability is moderately rapid to very rapid. Reaction ranges from strongly acid to neutral.

Because water accumulates in most of the pits, a few of the inactive pits have been stocked and are used by the public for fishing. Many pits on private land are posted.

This map unit was not assigned to an interpretive group.

5030—Pits, limestone quarry. This map unit consists of open pits from which limestone has been removed. The pits range from 20 to 60 feet or more in depth. A few pits are still being quarried; however, most of the pits are inactive (fig. 14). The areas are irregular in shape and range from 4 to 10 acres or more.

These open pits commonly are filled with water, and many are stocked with fish. Most of the stocked quarries are on private land and are posted.

This map unit was not assigned to an interpretive group.

5040—Orthents, loamy. This map unit consists of gently sloping to moderately steep soils that have been cut to obtain fill material for road grades and other similar types of construction. In most places, 2 to 20 feet of material has been removed. The remaining exposed material is generally loam, silt loam, clay loam, or silty clay loam.

The permeability of this material is moderate or moderately slow, and the available water capacity is high. Runoff ranges from rapid to ponded. The shrink-swell potential is moderate to high, and reaction is medium acid to neutral. These areas are very low in available phosphorus and potassium. The content of organic matter is less than 0.5 percent.

Onsite examination is needed to determine if an area is suitable for a specific use.

This map unit was not assigned to an interpretive group.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not subject to frequent flooding during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland if the limitations or hazards are overcome by such measures as drainage or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 142,000 acres in Henry County, or about 50 percent of the county, is prime farmland. The prime farmland soils are scattered throughout the county. Approximately 115,000 acres of prime farmland is used for crops. The crops grown, mainly corn and soybeans, account for an estimated three-fourths of the county's total agricultural income each year.

The map units, or soils, that make up prime farmland in Henry County are listed in table 4. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 260,000 acres in the county was used for agricultural purposes in 1979, according to the 1980 Iowa Agricultural Statistics (*5*). Of this total, approximately 154,000 acres was used for row crops, mainly corn and beans; 10,000 acres for close-grown crops, mainly oats; 11,000 acres for rotation hay and pasture; and 86,000 acres for pasture and other purposes.

Food production could be increased by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

More land is being used each year for urban development. Good land use should be based upon the properties and capabilities of soils. The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General Soil Map Units."

Soil erosion is the major soil problem on about two-thirds of the cropland and pasture in Henry County. If the slope is more than 2 percent, erosion is a hazard.

Loss of the surface layer through erosion is damaging for many reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. This is especially damaging if the subsoil is clayey. In many sloping fields, preparing a good seedbed and tilling are difficult in clayey spots because the original friable surface layer has been eroded away. Such spots are common in areas of moderately eroded soils. Erosion also reduces productivity on soils that tend to be droughty. As the surface layer of the soil is lost through erosion, sediment enters streams. Controlling erosion holds to a minimum the pollution of streams by sediment and improves water quality for municipal use, for recreation, and for fish and wildlife.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of

the soils. On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and also provide nitrogen and improve tilth for the following crop.

In some areas, slopes are so short, steep, and irregular that contour tillage or terracing is not practical. On these soils cropping systems that provide substantial vegetative cover and conservation tillage are required to control erosion. Examples of major conservation tillage systems include: (1) No-till, slot, or zero tillage—with this system, preparation of the seedbed and planting are completed in one operation. There is little or no soil disturbance except in the immediate area of the planted seed row. A protective cover of crop residue is left on at least 90 percent of the soil surface. (2) Strip till—with this system, seedbed preparation and planting are also completed in one operation. Tillage in the row is limited to a strip not wider than one-third of the total area. A protective cover of crop residue is left on two-thirds of the soil surface. (3) Chisel-disk or rotary tillage—this system loosens the soil over the entire surface and partially incorporates the residue into the soil. Seedbed preparation and planting may be in one or separate operations. Conservation tillage is not being practiced unless enough residue is left on the soil surface after planting to effectively reduce erosion.

Minimizing tillage and leaving crop residue on the surface can increase infiltration and reduce the hazards of runoff and erosion. These practices can be adapted to most tillable soils in the survey area, but are more difficult to apply successfully on the eroded soils and the soils that have a clayey surface layer. No-till planting of corn and soybeans is becoming more popular and is the most effective erosion control practice on continuously used cropland.

Terraces and diversions reduce the length of slopes and reduce runoff and erosion. They are most adaptable and practical on well drained soils that have regular side slopes and are gently sloping to moderately sloping. Other soils are less suitable for terraces and diversions because they have irregular side slopes, excessive wetness in the terrace channels, or a clayey subsoil that would be exposed in terrace channels.

Contouring and, less commonly, contour stripcropping are effective as erosion control practices. They are best suited to soils that have smooth, uniform slopes.

Wind erosion is a hazard on sandy soils. It can damage these soils in a few hours if winds are strong and soils are dry and bare of vegetation or surface mulch. Maintaining vegetative cover, surface mulch, or rough surfaces through proper tillage minimizes soil blowing on these soils.

Information on erosion control practices for each kind of soil is contained in the Technical Guide available in local offices of the Soil Conservation Service.

Soil drainage in some areas is the major management problem. Some soils are naturally wet and poorly drained, such as the Beckwith, Belinda, Edina, Haig, Kalona, Sperry, and Taintor soils in the uplands. Other poorly drained soils are along drainageways and on bottom lands and include the Colo and Okaw soils. Most of these soils become more productive where tiling is used, but some areas of Beckwith, Belinda, Edina, Haig, Sperry, and Okaw soils do not respond well to tiling. Surface drains may be the only practical method of draining some areas of Beckwith, Belinda, Edina, and Okaw soils.

Soil fertility is naturally low in many soils in the uplands, and most of these soils are naturally acid. The soils on flood plains, such as Colo, Klum, and Nodaway soils, are slightly acid to neutral.

Most soils in the uplands are naturally acid, and in unlimed areas, they require applications of ground limestone to raise the pH level sufficiently for alfalfa and other crops requiring nearly neutral soils to grow well. Available potash levels are naturally very low or low in most soils in the uplands. Available phosphorus in the subsoil is high in timbered soils such as Clinton soils, but medium in Ladoga soils and low in Otley soils. On all soils, additions of lime and fertilizer should be based on results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular, generally high in organic matter content, and porous.

Most of the soils used for crops in the survey area have a silt loam or silty clay loam surface layer. Some soils, such as Weller soils, are low in organic matter content and form a crust on the surface after an intense rainfall. Once the crust forms and reduces infiltration, runoff increases rapidly. Regular additions of crop residue, manure, and other organic material can improve soil structure and reduce crust formation.

Fall plowing is not a good practice on the light colored, timbered soils because a crust forms during winter and spring. Many of these soils are nearly as dense and hard at the time of planting after fall plowing as they were before they were plowed. Also, about two-thirds of the cropland consists of sloping soils that are subject to damaging erosion if they are plowed in fall.

Field crops suited to the soils and climate of the survey area include many that are not commonly grown. Corn and soybeans are by far the most common crops. Grain sorghum, wheat, oats, barley, sunflowers, potatoes, sugar beets, sweet corn, popcorn, pumpkins, canning peas, canning beans, and navy beans can be grown, and grass seed could be produced from bromegrass, redtop, bluegrass, switchgrass, big bluestem, and indiangrass.

Pasture and hay are important for the livestock industry in the county. Maximum grass and legume

production can be accomplished with correct treatment and use. Proper management practices for established stands include adequate fertilization, weed and brush control, rotational and deferred grazing with full season grazing systems, proper stocking, and adequate livestock watering facilities. A severe erosion hazard exists when sloping pasture and haylands are renovated by destroying the vegetative cover. When cultivated crops are to be grown prior to seeding, soil losses can be reduced by using conservation tillage, contouring, and grassed waterways. In addition, interseeding grasses and legumes into existing sod eliminates the need of destroying vegetative cover for seedbed preparation. The most common adapted plant species for pasture are bromegrass, bluegrass, reed canarygrass, orchardgrass, switchgrass, big bluestem, indiangrass, alfalfa, crownvetch, and ladino clover.

Special crops grown commercially in the survey area are limited at present to tomatoes and apples. Most of the well drained soils in the survey area are suitable for orchards and nursery plants. Soils in low positions where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

Latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that

water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

The original land survey of Iowa made during the period 1832-59 showed that out of 281,600 acres of land in the county, about 114,995 acres, or 40 percent, was covered by timber. Prairie grasses and forbs occupied the remainder of the land. The Andreas Atlas of 1875 gives a fairly reliable estimate of 57,191 acres of woodland. Early settlements saw a large amount of timber felled for construction, firewood, and fence posts; a much larger amount of timber was cleared to put the land to other uses, mainly agricultural uses. In 1954 and again in 1974, the U.S. Forest Service surveyed the state's forest resources. The 1954 results showed 36,000 acres of woodland in the county; the 1974 survey showed a decline to 23,000 acres. Most of the timber removals during the last 30 years were made for alternate agricultural uses on moderately steep to steep, highly erodible soils.

The principal species on the upland slopes in the county are white oak, northern red oak, black oak, bur oak, shagbark hickory, bitternut hickory, white ash, and green ash. Species in the lowlands and along drainageways include eastern cottonwood, silver maple, green ash, white ash, basswood, and black walnut. Black cherry, though common, is not plentiful, and river birch is scattered along a number of streams. Small American and red elms are abundant, but Dutch elm disease has drastically reduced the number of large trees. Most of the timber on uplands grows on Lindley, Weller, Clinton, and Keswick soils. Wooded areas on the bottom land are mainly in areas of the Nodaway-Colo association.

Most of the county's woodland is lightly to heavily pastured. If livestock graze or loaf in timber, their hooves damage tree bases and roots, compact the soil, and damage or destroy young tree regeneration. Also, livestock selectively browse on certain young trees, resulting in sparse, poor quality saplings that grow at a slower rate.

In the past, as in the present, woodland owners cut the better specimens of the desirable species for lumber and furniture. This "high-grading" left poorer trees and less desirable species to regenerate the woodland, which has resulted in a poorer quality woodland. Scientific management of the woodlands can make a stand of trees produce an increased volume of more valuable wood while also yielding a consistent amount of firewood from year to year. Soil losses can also be greatly reduced, and wildlife values can be enhanced.

Trees are a crop just as feed grains are a crop. There is, however, a much longer time between planting and harvesting. To produce the best crop, certain basics of management must be adhered to. The woodland must be protected from fire and destructive grazing. Then, with wildlife and other benefits in mind, the best potential crop trees should be designated and allowed to grow. The next basic step is to remove undesirable trees as well as vines that are competing with the crop trees for moisture, nutrients, and light. Total tree removal over a designated period of time should not exceed the total amount of growth. As certain crop trees become mature and ready to harvest, other younger trees await their growing space.

Soils vary greatly in their suitability for trees, and trees, as well, vary greatly in their ability to tolerate soils. As an example, green ash will tolerate a wet, poorly drained site as well as a droughty, south-facing slope. Most species, however, cannot tolerate so wide a range in soil conditions. They will grow and survive on a narrow to wide range of soils but grow at their best rate on a particular site with a particular soil composition. North and east slopes are better suited to trees than are south and west slopes. Generally, the deep, well drained or moderately well drained soils that are moderately fertile to highly fertile are well suited to trees. If the subsoil is slowly permeable, root development and, consequently, total development are reduced. Landowners can get help from the Soil Conservation District in judging the best use of their land. District foresters of the Iowa Conservation Commission can lend assistance in woodland management, tree planting, and insect and disease control.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter,

indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that

Figure 15.—A view of East Lake Park in the city of Mt. Pleasant, Iowa.

limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas (fig. 15).

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during

the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, orchardgrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cordgrass, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas

include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made

for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of calcium carbonate affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and becrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted,

and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock

fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, and bedrock.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders or organic matter. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as high content of calcium carbonate. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

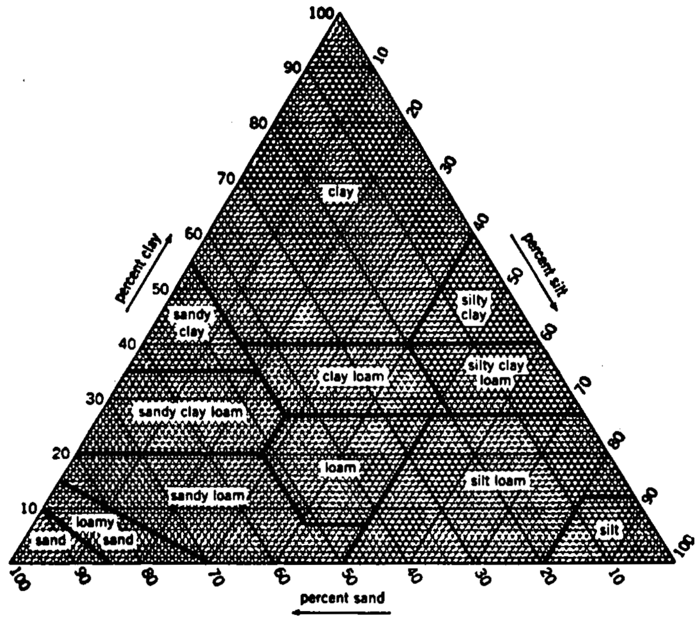


Figure 16.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 16). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one

of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The

change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it

occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*24*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol.* An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udoll (*Ud*, meaning humid, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiudolls (*Argi*, meaning argillic horizonation, plus *udoll*, the suborder of the Mollisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Argiudolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Argiudolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*23*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*24*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Adair Series

The Adair series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on short, convex side slopes and convex nose slopes in the uplands. These soils formed in a thin mantle of loamy sediment and in a paleosol that formed in glacial till. The Adair soils formed under a native vegetation of tall prairie grasses. Slopes range from 9 to 14 percent.

These soils are taxadjuncts to the Adair series because they do not have a mollic epipedon as defined in the range for the Adair series.

Adair soils are similar to Armstrong soils and are commonly adjacent to Clarinda, Otley, and Nira soils. Armstrong soils have less organic matter in the surface layer than Adair soils. Clarinda soils contain more clay and are lower in chroma in the 2Bt horizon. Otley and Nira soils contain more silt and less clay and sand in the B horizon. Clarinda, Otley, and Nira soils are upslope from Adair soils.

Typical pedon of Adair loam, 9 to 14 percent slopes, moderately eroded, 980 feet north and 360 feet east of the southwest corner of sec. 27, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; some streaks and pockets of brown (7.5YR 4/4) clay loam subsoil material; moderate fine and medium granular structure; friable; medium acid; gradual smooth boundary.

BA—8 to 14 inches; brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; gradual smooth boundary.

2Bt1—14 to 24 inches; brown (7.5YR 4/4) clay (42 percent clay); common fine and medium prominent yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) and common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; very firm; thin nearly continuous brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; medium acid; gradual smooth boundary.

2Bt2—24 to 29 inches; brown (7.5YR 4/4) clay (42 percent clay); common fine and medium prominent yellowish red (5YR 4/6) and dark reddish brown (5YR 3/4) and common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin nearly continuous brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; medium acid; gradual smooth boundary.

2Bt3—29 to 33 inches; brown (7.5YR 4/4) clay loam (38 percent clay); few fine prominent dark reddish brown (5YR 3/4) and yellowish red (5YR 4/6) and common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; slightly acid; gradual smooth boundary.

2Bt4—33 to 38 inches; yellowish brown (10YR 5/6) and brown (7.5YR 4/4) clay loam (38 percent clay); common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; neutral; gradual smooth boundary.

2Bt5—38 to 50 inches; strong brown (7.5YR 5/6) clay loam; common fine distinct brown (7.5YR 4/4), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous brown (7.5YR 4/2 & 4/4) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 5 percent small pebbles; neutral; gradual smooth boundary.

2Bt6—50 to 60 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 5/6), brown (7.5YR 4/4), and light brownish gray (2.5Y 6/2) mottles; weak medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/2 & 4/4) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 3 percent small pebbles; neutral.

The solum ranges from 40 to 65 inches in thickness.

The A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is clay loam, silty clay loam, or loam. The A horizon is medium acid or slightly acid in unlimed areas. The 2Bt1 horizon ranges from brown (7.5YR 4/4) to yellowish red (5YR 4/6). It is clay or clay loam. The 2Bt1 horizon is medium acid or strongly acid. Clay content of the 2Bt horizon ranges from 38 to 50 percent, and the upper 20 inches of the Bt horizon averages between 38 and 46 percent. The lower part of the 2Bt horizon ranges from dark yellowish brown (10YR 4/4) to strong brown (7.5YR 5/6).

Ainsworth Series

The Ainsworth series consists of moderately well drained, moderately slowly permeable soils on low stream terraces. These soils formed in silty sediments underlain by stratified fine or medium sand of eolian or alluvial origin under a native vegetation of deciduous trees. Slopes range from 2 to 18 percent.

Ainsworth soils are similar to Clinton soils and are commonly adjacent to Galland, Lamont, and Okaw soils. Clinton soils contain less sand in the B horizon than

Ainsworth soils and do not have the stratified sand in the C horizon. Galland soils contain more sand and less silt in the B horizon. Lamont soils contain more sand and less clay and silt throughout the profile. Okaw soils are lower in chroma in the Bt horizon. Galland and Lamont soils typically are upslope from Ainsworth soils, and Okaw soils generally are downslope.

Typical pedon of Ainsworth silt loam, 2 to 5 percent slopes, 600 feet north and 1,170 feet east of the southwest corner of sec. 24, T. 70 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; some mixings of brown (10YR 4/3 & 5/3) silt loam E material; moderate medium granular structure; friable; neutral; clear smooth boundary.

E—8 to 12 inches; brown (10YR 5/3 & 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure; friable; slightly acid; gradual smooth boundary.

BE—12 to 18 inches; brown (10YR 4/3) silty clay loam (29 percent clay); moderate very fine and fine subangular blocky structure; friable; many light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—18 to 25 inches; yellowish brown (10YR 5/4) silty clay loam (35 percent clay); moderate fine and medium subangular blocky structure; friable; common thin discontinuous brown (10YR 4/3) and dark brown (10YR 3/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—25 to 34 inches; yellowish brown (10YR 5/4) silty clay loam (37 percent clay); moderate medium subangular blocky structure; friable; common thin discontinuous brown (10YR 4/3) and dark brown (10YR 3/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt and sand coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt3—34 to 44 inches; yellowish brown (10YR 5/4) silty clay loam (36 percent clay); few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; common thin discontinuous brown (10YR 4/3) and dark brown (10YR 3/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt and sand coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

BC—44 to 54 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; common light gray (10YR 7/2) and white (10YR 8/1) dry silt and sand coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; abrupt wavy boundary.

2C—54 to 60 inches; yellowish brown (10YR 5/4) sand with thin lenses of dark yellowish brown (10YR 4/4) sandy loam; single grained; loose; medium acid.

The solum ranges from 45 to 65 inches in thickness.

The A horizon ranges from very dark grayish brown (10YR 3/2) to brown (10YR 4/3). It has value of 3 only where it is 6 inches or less thick. The A horizon is 4 to 10 inches thick and ranges from medium acid to neutral. The E horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). It is slightly acid or medium acid. Some pedons do not have an E horizon. The Bt horizon ranges from brown (10YR 4/3) or yellowish brown (10YR 5/4) to brown (7.5YR 5/4). Clay content of the Bt horizon ranges from 32 to 40 percent, and the upper 20 inches of the Bt horizon averages between 35 and 38 percent clay. The Bt horizon ranges from slightly acid to strongly acid.

Arispe Series

The Arispe series consists of moderately well drained or somewhat poorly drained, moderately slowly permeable soils. These soils are on short, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. Arispe soils formed in leached loess under a native vegetation of prairie grasses. Slopes range from 5 to 9 percent.

Arispe soils are commonly adjacent to Clarinda and Grundy soils. Clarinda and Grundy soils have more clay in the Bt horizon than Arispe soils, and Clarinda soils are more poorly drained. Clarinda soils are downslope from Arispe soils, and Grundy soils are upslope.

Typical pedon of Arispe silty clay loam, 5 to 9 percent slopes, 48 feet south and 1,390 feet west of the northeast corner of sec. 31, T. 70 N., R. 6 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; medium acid; abrupt smooth boundary.

BA—9 to 13 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate very fine and fine subangular blocky structure; friable; many black (10YR 2/1) coatings on faces of peds; few wormcasts of dark grayish brown (10YR 4/2); few brown (7.5YR 4/4) concretions (manganese and iron oxides); medium acid; clear smooth boundary.

Bt1—13 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam (38 percent clay); common fine distinct brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; many very dark gray (10YR 3/1) and black (10YR 2/1) coatings on faces of peds; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown

(10YR 4/2) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—16 to 24 inches; dark grayish brown (10YR 4/2) silty clay (41 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg1—24 to 34 inches; dark grayish brown (2.5Y 4/2) silty clay loam (39 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) and very dark grayish brown (2.5Y 3/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—34 to 41 inches; grayish brown (2.5Y 5/2) silty clay loam (35 percent clay); common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—41 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Cg—48 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 36 to 60 inches in thickness. Thickness of the mollic epipedon is 10 to 14 inches.

The Ap or A horizon typically is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The Ap or A horizon is 6 to 10 inches thick and ranges from neutral to medium acid. The Bt horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3 or 5/3). The Bt horizon ranges from strongly acid to slightly acid. Clay content of the B horizon ranges from 35 to 42 percent, and the upper 20 inches of the B horizon averages between 35 and 40 percent clay. The Btg, BCg, and Cg horizons range from dark grayish brown (2.5Y 4/2) to gray (5Y 6/1). The Btg and BCg horizons range from medium acid to neutral. The Cg horizon typically is neutral or slightly acid.

Map unit 23C2 is taxadjunct to the Arispe series because it does not have a mollic epipedon that is defined in the range for the Arispe series.

Armstrong Series

The Armstrong series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on short, convex side slopes, narrow, convex ridgetops, and convex nose slopes in the uplands. These soils formed in a thin mantle of loamy sediments and in a paleosol which formed in glacial till. The Armstrong soils formed under a native vegetation of mixed tall prairie grasses and deciduous trees. Slopes range from 9 to 14 percent.

Armstrong soils are similar to Adair and Keswick soils and are commonly adjacent to Gara, Ladoga, Lineville, Pershing, and Rinda soils. Adair soils contain more organic matter than Armstrong soils. Keswick soils have a thinner or lighter colored A horizon. Gara and Lineville soils have less clay in the Bt horizon. Ladoga and Pershing soils have more silt and less sand throughout the solum. Rinda soils have more clay and are lower in chroma in the B horizon. Gara soils are downslope from Armstrong soils and Ladoga, Lineville, Pershing, and Rinda soils are upslope.

Typical pedon of Armstrong clay loam, 9 to 14 percent slopes, moderately eroded, 200 feet south and 1,880 feet east of the northwest corner of sec. 17, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) clay loam, grayish brown (10YR 5/2) dry; some streaks and pockets of brown (7.5YR 4/4) clay subsoil material; kneaded, very dark grayish brown (10YR 3/2); moderate medium granular structure; friable; 2 percent small pebbles; medium acid; clear smooth boundary.

2Bt1—8 to 12 inches; brown (7.5YR 4/4) clay (42 percent clay); common fine prominent mottles of dark reddish brown (5YR 3/4); moderate fine subangular blocky structure; very firm; common thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent small pebbles; medium acid; gradual smooth boundary.

2Bt2—12 to 18 inches; brown (7.5YR 4/4) clay (42 percent clay); common fine prominent dark reddish brown (5YR 3/4), yellowish red (5YR 4/6), and dark red (2.5YR 3/6) and common fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; very firm; common thin discontinuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; 3

percent small pebbles; medium acid; gradual smooth boundary.

2Bt3—18 to 24 inches; strong brown (7.5YR 5/6) clay loam (38 percent clay); common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on faces of peds; 3 percent small pebbles; medium acid; gradual smooth boundary.

2Bt4—24 to 32 inches; strong brown (7.5YR 5/6) clay loam (38 percent clay); common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on faces of peds; common light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; medium acid; gradual smooth boundary.

2Bt5—32 to 37 inches; strong brown (7.5YR 5/6) clay loam (38 percent clay); few fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark grayish (10YR 4/2) and grayish brown (10YR 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 2 percent small pebbles; medium acid; gradual smooth boundary.

2Bt6—37 to 48 inches; strong brown (7.5YR 5/6) clay loam (38 percent clay); common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 2 percent small pebbles; slightly acid; gradual smooth boundary.

2BC—48 to 60 inches; strong brown (7.5YR 5/6) clay loam; common fine distinct grayish brown (10YR 5/2) and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; few thin patchy dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films in root channels; common fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; common very fine segregations of calcium carbonate; neutral.

The solum ranges from 42 to 80 inches in thickness.

The Ap or A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). Texture of the A or Ap horizon is loam, silt loam, or clay loam. The A or Ap horizon is 7 to 9 inches thick and is medium acid or slightly acid in unlimed areas. The 2Bt horizon ranges from brown (7.5YR 4/4) to yellowish red (5YR 5/6). Clay content of the 2Bt horizon ranges from 36 to 48 percent. The 2Bt horizon ranges from very strongly acid to slightly acid.

Ashgrove Series

The Ashgrove series consists of poorly drained, very slowly permeable soils on short, convex side slopes and convex nose slopes and in coves at the upper end of drainageways in the uplands. These soils formed in a paleosol which formed in glacial till under a native vegetation of deciduous trees. Slopes range from 9 to 14 percent.

Ashgrove soils are similar to Rinda soils and are commonly adjacent to Keswick, Lindley, and Weller soils. Rinda soils have a thicker or darker A horizon than Ashgrove soils. Keswick, Lindley, and Weller soils are higher in chroma in the B horizon. In addition, Lindley soils have less clay in the B horizon, and Weller soils have less sand and more silt throughout the solum. Keswick and Lindley soils are downslope from Ashgrove soils, and Weller soils are upslope.

Typical pedon of Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded, 225 feet north and 1,930 feet east of the southwest corner of sec. 18, T. 71 N., R. 7 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; some streaks and pockets of grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam subsoil material; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

BE—5 to 9 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; common fine faint yellowish brown (10YR 5/4 & 5/6) mottles; weak very fine and fine subangular blocky structure; firm; few dark grayish brown (10YR 4/2) coatings on faces of peds; very strongly acid; clear smooth boundary.

2Bt1—9 to 14 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay; common fine faint and distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; thin nearly continuous grayish brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); few coarse quartz grains; very strongly acid; gradual smooth boundary.

2Bt2—14 to 20 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) clay; common fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate very fine and fine subangular blocky and angular blocky structure; very firm; thin nearly continuous grayish brown (10YR 5/2) and brown

(10YR 5/3) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); few coarse quartz grains; strongly acid; gradual smooth boundary.

2Btg1—20 to 28 inches; grayish brown (10YR 5/2) clay; common fine distinct dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky and angular blocky structure; very firm; thin nearly continuous grayish brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); few coarse quartz grains; medium acid; gradual smooth boundary.

2Btg2—28 to 37 inches; grayish brown (10YR 5/2) clay; common fine distinct dark yellowish brown (10YR 3/4) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous grayish brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; common fine segregations (iron and manganese oxides); few coarse quartz grains; slightly acid; gradual smooth boundary.

2Btg3—37 to 48 inches; gray (5Y 5/1) clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous gray (5Y 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent coarse quartz grains and small pebbles; slightly acid; gradual smooth boundary.

2Btg4—48 to 60 inches; light olive gray (5Y 6/2) clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; common thin discontinuous gray (5Y 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent coarse quartz grains and small pebbles; strongly acid.

The solum ranges from 48 to 84 inches in thickness. Typically, the Ashgrove soils have an Ap horizon, but in some areas thin A and E horizons are present. The A horizon, where present, ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2) and is 4 inches thick or less. The Ap horizon is 5 to 8 inches thick and ranges from very strongly acid to medium acid in unlimed areas. The E horizon, where present, is grayish brown (10YR 5/2) or brown (10YR 5/3) and is silty clay loam or silt loam. The 2Bt horizon ranges from gray (10YR 5/1) to brown (10YR 5/3) to pale olive (5Y 6/3). It ranges from very strongly acid to neutral.

Beckwith Series

The Beckwith series consists of poorly drained, very slowly permeable soils in small, flat areas on ridgetops in the loess-covered uplands. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 0 to 2 percent.

Beckwith soils are similar to Belinda soils and are commonly adjacent to Weller soils. Belinda soils have more organic matter in the surface layer than Beckwith soils and have a thicker or darker A horizon. Weller soils are higher in chroma in the Bt horizon and are downslope from Beckwith soils.

Typical pedon of Beckwith silt loam, 0 to 2 percent slopes, 1,850 feet south and 1,580 feet west of the northeast corner of sec. 31, T. 70 N., R. 5 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, gray (10YR 6/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 15 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/1) dry; common fine faint grayish brown (10YR 5/2) mottles; moderate medium platy structure; friable; strongly acid; clear smooth boundary.

Btg1—15 to 21 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; very firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—21 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine faint and distinct strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—29 to 37 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine faint and distinct strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg4—37 to 46 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and

manganese oxides); medium acid; gradual smooth boundary.

BCg—46 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 42 to 72 inches in thickness.

The A horizon, where present, is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 5 inches thick or less and ranges from very strongly acid to medium acid. The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). It ranges from very strongly acid to medium acid in unlimed areas. The E horizon is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2). It ranges from very strongly acid to medium acid. The Btg horizon is dark grayish brown (10YR 4/2 or 2.5Y 4/2) or grayish brown (2.5Y 5/2) and ranges from very strongly acid to medium acid.

Belinda Series

The Belinda series consists of poorly drained, very slowly permeable soils on narrow to moderately broad upland divides and on high stream benches. These soils formed in leached loess under a native vegetation of mixed grasses and deciduous trees. Slopes range from 0 to 2 percent.

Belinda soils are similar to Beckwith and Edina soils and are commonly adjacent to Pershing soils. Beckwith soils have less organic matter in the surface layer than Belinda soil, and Edina soils have more organic matter. Beckwith soils have a thinner or lighter colored A horizon, and Edina soils have a mollic epipedon. Pershing soils are higher in chroma in the Bt horizon and are downslope from Belinda soils.

Typical pedon of Belinda silt loam, 0 to 2 percent slopes, 1,700 feet north and 125 feet west of the southeast corner of sec. 20, T. 70 N., R. 6 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

E1—9 to 13 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; moderate thin and medium platy structure; friable; many light gray (10YR 7/1) dry silt coatings on faces of peds; medium acid; clear smooth boundary.

E2—13 to 18 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to weak very fine subangular blocky; friable; many light gray (10YR 7/1) dry silt coatings on faces of peds; few fine segregations (iron and manganese oxides); strongly acid; clear smooth boundary.

Btg1—18 to 24 inches; dark grayish brown (10YR 4/2) silty clay; common fine faint and distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to strong fine subangular blocky and angular blocky; very firm; common very dark gray (10YR 3/1) coatings on faces of peds; thin continuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—24 to 31 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6), olive brown (2.5Y 4/4), and grayish brown (2.5Y 5/2) mottles; moderate medium prismatic structure parting to strong fine subangular blocky and angular blocky; very firm; thin continuous very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—31 to 38 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and dark grayish brown (2.5Y 4/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky and angular blocky; very firm; thin nearly continuous dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2), and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg4—38 to 46 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2), and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—46 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few thin patchy dark grayish brown (2.5Y 4/2), very dark grayish brown (2.5Y 3/2), and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); medium acid.

The solum is 60 inches or more thick. Carbonates are commonly lacking to an even greater depth.

The A or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A or Ap horizon is 7 to 9 inches thick and ranges from strongly acid to slightly acid in unlimed areas. The E horizon ranges from dark gray (10YR 4/1) to grayish brown (2.5Y 5/2). The Btg horizon ranges from dark grayish brown (10YR 4/2) to olive gray (5Y 5/2). The Btg horizon ranges from very strongly acid to medium acid.

Cantril Series

The Cantril series consists of somewhat poorly drained, moderately permeable soils on slightly concave to plane foot slopes on uplands. These soils formed in loamy local alluvium under a native vegetation of mixed prairie grasses and trees. Slopes range from 2 to 5 percent.

Cantril soils are commonly adjacent to Lindley and Nodaway soils. Lindley soils are higher in chroma in the B horizon than Cantril soils and have a thinner or lighter colored A horizon. Nodaway soils have less clay and sand in the control section. Lindley soils are upslope from Cantril soils, and Nodaway soils are downslope.

Typical pedon of Cantril loam, 2 to 5 percent slopes, 1,780 feet south and 1,450 feet west of the northeast corner of sec. 34, T. 70 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E—8 to 12 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium platy structure parting to moderate very fine subangular blocky; friable; few light brownish gray (10YR 6/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

BE—12 to 16 inches; dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) loam; moderate fine subangular blocky structure; friable; common light brownish gray (10YR 6/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—16 to 20 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) clay loam; common fine faint yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous brown (7.5YR 4/2) clay films on faces of peds; common light brownish gray (10YR 6/2) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt2—20 to 29 inches; grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt3—29 to 38 inches; grayish brown (10YR 5/2) and brown (10YR 4/3) clay loam; common fine distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; few light gray (10YR 7/2) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt4—38 to 50 inches; brown (10YR 4/3) clay loam; common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; massive; friable; few fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 42 to 60 inches in thickness.

The A or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). Texture of the A or Ap horizon is loam or silt loam high in sand. The A or Ap horizon is 7 to 9 inches thick. The E horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It is loam or silt loam high in sand and ranges from strongly acid to slightly acid. The Bt horizon ranges from strongly acid to slightly acid.

Chelsea Series

The Chelsea series consists of excessively drained, rapidly permeable soils on uplands and stream terraces. These soils formed in eolian sand and sandy alluvium that has been reworked by wind under a native vegetation of deciduous trees. Slopes range from 2 to 25 percent.

Chelsea soils are commonly adjacent to Fayette and Lamont soils. Fayette soils have more silt and clay and less sand throughout the solum than Chelsea soils. Lamont soils have a thicker B horizon and have more clay in the B horizon. The Fayette and Lamont soils are so intermingled with the Chelsea soils that they are

mapped together as a complex. In some places Fayette and Lamont soils are downslope from Chelsea soils, but in other places they are upslope.

Typical pedon of Chelsea loamy fine sand, in an area of Chelsea-Lamont-Fayette complex, 5 to 9 percent slopes, 880 feet south and 260 feet west of the northeast corner of sec. 6, T. 72 N., R. 7 W.

Ap—0 to 8 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; medium acid; clear smooth boundary.

E1—8 to 17 inches: brown (10YR 4/3) fine sand, pale brown (10YR 6/3) dry; single grained; loose; strongly acid; gradual smooth boundary.

E2—17 to 35 inches; yellowish brown (10YR 5/4) fine sand, light yellowish brown (10YR 6/4) dry; single grained; loose; strongly acid; gradual smooth boundary.

E&Bt—35 to 60 inches; yellowish brown (10YR 5/4) fine sand, light yellowish brown (10YR 6/4) dry (E); single grained; loose; 1/2- to 2-inch-thick bands of brown (7.5YR 4/4) sandy loam (Bt) at 38, 44, 52, and 58 inches; strongly acid.

The solum ranges from 48 inches to many feet in thickness.

The Ap or A horizon ranges from very dark gray (10YR 3/1) to brown (10YR 4/3). The 3 value colors are less than 6 inches thick. The Ap or A horizon is 2 to 10 inches thick and ranges from medium acid to neutral. The E horizon ranges from dark grayish brown (10YR 4/2) to brownish yellow (10YR 6/6). The Bt part of the E&Bt horizon is brown (10YR 4/3 to 7.5YR 4/4) and is sandy loam or loamy sand.

Clarinda Series

The Clarinda series consists of poorly drained, very slowly permeable soils on short, convex side slopes, convex nose slopes, and in coves at the upper end of drainageways in the uplands. These soils formed in a paleosol, which formed in glacial till, under a native vegetation of prairie grasses. Slopes range from 5 to 9 percent.

Clarinda soils are similar to Rinda soils and are commonly adjacent to Adair, Arispe, Nira, and Otley soils. Rinda soils have less organic matter in the surface layer than Clarinda soils and have a thinner or lighter colored A horizon. Adair soils contain less clay and are higher in chroma in the 2Bt horizon. Arispe, Nira, and Otley soils contain more silt and less clay and sand and are higher in chroma in the Bt horizon. Arispe, Nira, and Otley soils are upslope from Clarinda soils, and Adair soils are downslope.

Typical pedon of Clarinda silty clay loam, 5 to 9 percent slopes, 720 feet south and 2,420 feet east of the northwest corner of sec. 22, T. 72 N., R. 5 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; neutral; clear smooth boundary.

A—7 to 11 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; slightly acid; gradual smooth boundary.

2Btg1—11 to 15 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6), grayish brown (2.5Y 5/2), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; very firm; thin nearly continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

2Btg2—15 to 22 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6), grayish brown (2.5Y 5/2), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; very firm; thin nearly continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); few white sand grains; medium acid; gradual smooth boundary.

2Btg3—22 to 27 inches; dark gray (10YR 4/1) clay; few fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; thin nearly continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); few white sand grains; medium acid; gradual smooth boundary.

2Btg4—27 to 36 inches; gray (10YR 5/1) clay; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; thin nearly continuous dark gray (10YR 4/1) and gray(10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); few white sand grains; slightly acid; gradual smooth boundary.

2Btg5—36 to 50 inches; gray (10YR 5/1) clay; common fine distinct yellowish brown (10YR 5/6), dark gray (10YR 4/1), and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); few white sand grains; slightly acid; gradual smooth boundary.

2Btg6—50 to 60 inches; gray (10YR 5/1) clay; common fine distinct yellowish brown (10YR 5/6), gray (10YR 6/1), and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very firm; common thin

discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); few white sand grains; neutral.

The solum ranges from 48 to more than 72 inches in thickness. The mollic epipedon ranges from 10 to 20 inches thick.

The A horizon is 10 to 16 inches thick and is medium acid or slightly acid in unlimed areas. It formed in loess or silty sediments. The A horizon is black (10YR 2/1) or very dark gray (10YR 3/1). The 2Btg horizon ranges from dark gray (10YR 4/1) to gray (5Y 5/1). It ranges from strongly acid to neutral.

Map unit 222C2 is taxadjunct to the Clarinda series because it does not have a mollic epipedon that is defined in the range for the Clarinda series.

Clinton Series

The Clinton series consists of moderately well drained, moderately slowly permeable soils on convex ridgetops and the upper part of side slopes in the uplands and on high stream benches. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 2 to 14 percent.

Clinton soils are similar to Ladoga soils and are commonly adjacent to Keomah, Keswick, Lindley, and Rushville soils. Ladoga soils have a thicker, darker A horizon than Clinton soils. Keomah, Keswick, and Rushville soils are lower in chroma in the Bt horizon. Keswick and Lindley soils have more sand in the solum. Keomah and Rushville soils are upslope from Clinton soils, and Keswick and Lindley soils are downslope.

Typical pedon of Clinton silt loam, 2 to 5 percent slopes, 1,030 feet north and 75 feet east of the southwest corner of sec. 16, T. 73 N., R. 7 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; friable; slightly acid; abrupt smooth boundary.

E1—2 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; abrupt smooth boundary.

E2—5 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate thin platy structure; friable; common dark grayish brown (10YR 4/2) coatings on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; slightly acid; abrupt smooth boundary.

E3—8 to 14 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium platy structure; friable; few light gray (10YR 7/1) dry silt coatings on faces of peds; medium acid; clear smooth boundary.

BE—14 to 19 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silty clay loam; moderate fine subangular blocky structure; friable; common light gray (10YR 7/1) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt1—19 to 29 inches; dark yellowish brown (10YR 4/4) silty clay loam (38 percent clay); strong fine subangular blocky and angular blocky structure; firm; thin nearly continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common light gray (10YR 7/1) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—29 to 40 inches; yellowish brown (10YR 5/4) silty clay loam (39 percent clay); moderate medium prismatic structure parting to moderate fine and medium subangular blocky and angular blocky; firm; thin nearly continuous dark yellowish brown (10YR 4/4) and brown (10YR 4/3) clay films on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt3—40 to 51 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky and angular blocky; firm; common thin discontinuous dark yellowish brown (10YR 4/4) and brown (10YR 4/3) clay films on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; few fine segregations (iron and manganese oxides); medium acid; gradual smooth boundary.

BC—51 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky and angular blocky; friable; few light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 42 to 72 inches in thickness.

The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 5 inches thick or less and is medium acid or slightly acid in unlimed areas. Some pedons do not have an A horizon. The Ap horizon, where present, is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It ranges from strongly acid to slightly acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). It ranges from strongly acid to slightly acid. The Bt horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/4). It is silty clay loam or silty clay. Clay content of the upper 20 inches of the Bt horizon ranges from 36 to 42 percent. The Bt horizon ranges from strongly acid to slightly acid.

Colo Series

The Colo series consists of poorly drained, moderately permeable soils on bottom lands. These soils formed in silty alluvium under a native vegetation of swamp grasses, sedges, and prairie grasses that tolerate wetness. Slopes range from 0 to 5 percent.

Colo soils are similar to Lawson soils and are commonly adjacent to Coppock, Lawson, Nodaway, Tuskeego, and Vesser soils. Coppock, Tuskeego, and Vesser soils have E and Bt horizons. Lawson and Nodaway soils are stratified, have less clay than Colo soils, and have a thinner A horizon. Coppock, Lawson, Nodaway, Tuskeego, and Vesser soils are at the slightly higher elevations.

Typical pedon of Colo silty clay loam, 0 to 2 percent slopes, 180 feet north and 780 feet west of the southeast corner of sec. 24, T. 72 N., R. 5 W.

A1—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

A2—7 to 12 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

A3—12 to 18 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; neutral; gradual smooth boundary.

A4—18 to 26 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium prismatic structure parting to moderate medium subangular blocky; firm; neutral; gradual smooth boundary.

A5—26 to 33 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; neutral; gradual smooth boundary.

A6—33 to 42 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

AC—42 to 52 inches; very dark gray (10YR 3/1) silty clay loam; common fine faint dark gray (5Y 4/1) mottles; weak medium subangular blocky structure; firm; neutral; gradual smooth boundary.

Cg—52 to 60 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; common very dark gray (10YR 3/1) coatings on faces of peds; neutral.

The solum ranges from 36 to 54 inches in thickness. The mollic epipedon is 36 to 60 inches thick.

The A horizon ranges from black (N 2/0) to very dark gray (10YR 3/1). Texture of the A or Ap horizon is silty clay loam or silt loam. The A horizon is 36 to 54 inches thick and is slightly acid or neutral.

Coppock Series

The Coppock series consists of somewhat poorly drained or poorly drained, moderately permeable soils on very low stream terraces, foot slopes, and alluvial fans. These soils formed in silty alluvium under a native vegetation of trees and tall grasses. Slopes range from 0 to 2 percent.

Coppock soils are similar to Vesser soils and are commonly adjacent to Colo, Nodaway, Tuskeego, and Vesser soils. Vesser soils have a mollic epipedon. Colo and Nodaway soils do not have E and Bt horizons. Tuskeego soils have more clay in the B horizon than Coppock soils. Tuskeego soils are slightly higher on the landscape, and Colo and Nodaway soils are lower. Vesser soils are at the same elevation as Coppock soils.

Typical pedon of Coppock silt loam, 0 to 2 percent slopes, 2,500 feet south and 100 feet east of the northwest corner of sec. 6, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

E1—8 to 14 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium platy structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; gradual smooth boundary.

E2—14 to 21 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint dark grayish brown (10YR 4/2) mottles; moderate medium platy structure; friable; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

E3—21 to 25 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint and distinct dark grayish brown (10YR 4/2), brown (10YR 5/3), and yellowish brown (10YR 5/6) mottles; moderate thin platy structure parting to weak fine subangular blocky; friable; many light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg1—25 to 34 inches; light brownish gray (10YR 6/2) silty clay loam; common fine faint and distinct grayish brown (10YR 5/2), brown (10YR 5/3), and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous dark gray (10YR 4/1), gray (10YR 5/1), and grayish brown (10YR 5/2) clay films on faces of peds; common light gray (10YR

7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—34 to 45 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine faint and distinct yellowish brown (10YR 5/4), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; friable; common thin discontinuous dark gray (10YR 4/1), gray (10YR 5/1), and grayish brown (10YR 5/2) clay films on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—45 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine faint and distinct yellowish brown (10YR 5/4 & 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine and medium segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 40 to 70 inches in thickness.

The A or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 7 to 9 inches thick and ranges from strongly acid to neutral. The E horizon ranges from dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2) to gray (10YR 5/1). It ranges from strongly acid to slightly acid. The Btg horizon ranges from gray (10YR 5/1) to light brownish gray (2.5Y 6/2). It ranges from very strongly acid to medium acid.

Dickinson Series

The Dickinson series consists of well drained and somewhat excessively drained soils on stream terraces. These soils formed in medium textured and moderately coarse textured alluvium, which is wind-reworked in many places, under a native vegetation of prairie grasses. Permeability is moderately rapid or rapid. Slopes range from 0 to 2 percent.

Dickinson soils are commonly adjacent to Hoopeston and Sparta soils. Hoopeston soils are lower in chroma in the B horizon than Dickinson soils. Sparta soils contain more sand and less clay throughout the solum. Hoopeston soils are at the slightly lower elevations, and Sparta soils are at the slightly higher elevations.

Typical pedon of Dickinson fine sandy loam, 0 to 2 percent slopes, 810 feet north and 2,365 feet west of the southeast corner of sec. 30, T. 73 N., R. 7 W.

Ap—0 to 10 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; slightly acid; clear smooth boundary.

A—10 to 15 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure parting to moderate fine granular; very friable; slightly acid; gradual smooth boundary.

Bw1—15 to 21 inches; dark brown (10YR 3/3) fine sandy loam; weak fine and medium subangular blocky structure; very friable; continuous very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bw2—21 to 29 inches; brown (10YR 4/3) fine sandy loam; weak fine and medium subangular blocky structure; very friable; common dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) coatings on faces of peds; medium acid; gradual smooth boundary.

Bw3—29 to 34 inches; brown (10YR 4/3) fine sandy loam; weak fine and medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

BC—34 to 45 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak fine subangular blocky structure; very friable; medium acid; abrupt smooth boundary.

C—45 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grained; loose; medium acid.

The solum ranges from 36 to 50 inches in thickness. Thickness of the mollic epipedon is 10 to 22 inches.

The A horizon has value of 2 or 3 and chroma of 1 or 3. It dominantly is fine sandy loam, but the range includes sandy loam and loam. The A horizon ranges from neutral to medium acid. The Bw horizon has value of 3 to 5 and chroma of 2 to 6. It dominantly is fine sandy loam, but the range includes sandy loam, loamy fine sand, loamy sand, fine sand, and sand. The Bw horizon is medium acid or slightly acid. The C horizon has value of 4 or 5 and chroma of 3 to 6. It dominantly is sand, but the range includes loamy fine sand, loamy sand, and fine sand.

Douds Series

The Douds series consists of moderately well drained, moderately permeable soils on high stream benches along most of the major streams and rivers in the county. These soils formed in loamy and sandy, stratified, water-sorted glacial sediments deposited as alluvium during an earlier geological period. These soils formed under a native vegetation of deciduous trees. Slopes range from 14 to 40 percent.

Douds soils are commonly adjacent to Galland and Nordness soils. Galland soils have more clay in the Bt horizon than Douds soils. Nordness soils are shallow to

bedrock. Galland and Nordness soils are downslope from Douds soils.

Typical pedon of Douds loam, 14 to 18 percent slopes, 2,420 feet south and 990 feet west of the northeast corner of sec. 25, T. 71 N., R. 7 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E1—4 to 7 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; common fine faint brown (10YR 4/3) mottles; weak medium platy structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

E2—7 to 10 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium and thick platy structure parting to weak fine and medium subangular blocky; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

BE—10 to 14 inches; brown (10YR 4/3) loam; moderate fine subangular blocky structure; friable; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt1—14 to 21 inches; strong brown (7.5YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable; thin nearly continuous brown (7.5YR 4/4) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—21 to 26 inches; strong brown (7.5YR 5/6) and brown (7.5YR 4/4) clay loam; moderate fine and medium subangular blocky and angular blocky structure; friable; thin nearly continuous brown (7.5YR 4/4) clay films on faces of peds; few light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt3—26 to 31 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; few thin patchy brown (7.5YR 4/4) clay films on faces of peds; few light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt4—31 to 37 inches; strong brown (7.5YR 5/6) loamy sand; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium and coarse subangular blocky structure; very friable; few thin patchy brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt5—37 to 45 inches; strong brown (7.5YR 5/6) loam; common fine faint yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; common thin patchy brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

BC—45 to 52 inches; strong brown (7.5YR 5/6) sandy loam; common fine faint yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; strongly acid; gradual smooth boundary.

C1—52 to 55 inches; strong brown (7.5YR 5/6) loamy sand; common fine faint yellowish brown (10YR 5/6) mottles; massive; very friable; strongly acid; gradual smooth boundary.

C2—55 to 60 inches; strong brown (7.5YR 5/6) sandy loam; common fine faint brown (7.5YR 4/4) mottles; massive; friable; common fine segregations (iron and manganese oxides); strongly acid.

The solum ranges from 42 to 72 inches in thickness.

The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is loam or silt loam high in sand. The A horizon is 5 inches or less in thickness and is strongly acid or medium acid in unlimed areas. Some pedons do not have an A horizon. The Ap horizon, where present, is dark grayish brown (10YR 4/2). It is loam, silt loam, or clay loam and is strongly acid or medium acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). It is loam or silt loam high in sand. The E horizon ranges from very strongly acid to medium acid. Some pedons do not have an E horizon. The Bt horizon ranges from dark yellowish brown (10YR 4/4) to strong brown (7.5YR 5/6). It ranges from very strongly acid to medium acid.

Edina Series

The Edina series consists of poorly drained, very slowly permeable soils on narrow to broad upland divides. These soils formed in leached loess under a native vegetation of prairie grasses. Slopes range from 0 to 1 percent.

Edina soils are similar to Belinda soils and are commonly adjacent to Haig soils. Belinda soils do not have a mollic epipedon. Haig soils do not have an E horizon. Haig soils are on slightly higher elevations than Edina soils.

Typical pedon of Edina silt loam, 0 to 1 percent slopes, 1,335 feet north and 2,545 feet west of the southeast corner of sec. 35, T. 70 N., R. 6 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

E—10 to 17 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; weak thin and medium platy structure; friable; common very dark gray (10YR

3/1) coatings on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt—17 to 20 inches; very dark gray (10YR 3/1) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common thin discontinuous black (10YR 2/1) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg1—20 to 27 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin nearly continuous very dark gray (10YR 3/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—27 to 33 inches; olive gray (5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin nearly continuous dark gray (10YR 4/1) and very dark gray (10YR 3/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg3—33 to 41 inches; olive gray (5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) and light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common thin discontinuous dark gray (5Y 4/1), gray (5Y 5/1), and very dark gray (5Y 3/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BCg—41 to 48 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Cg—48 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 44 to 60 inches in thickness. The Ap horizon and, where present, the A horizon range from black (10YR 2/1) to very dark grayish brown (10YR 3/2), are 10 to 14 inches thick, and are slightly acid or neutral. The E horizon ranges from strongly acid to slightly acid. The Bt horizon ranges from very dark gray (10YR 3/1) to olive gray (5Y 5/2).

Fayette Series

The Fayette series consists of well drained, moderately permeable soils on convex ridgetops and the upper part of side slopes in the uplands. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 2 to 25 percent.

Fayette soils are commonly adjacent to Chelsea and Lamont soils. Chelsea and Lamont soils contain more sand and less clay and silt than Fayette soils. In some places the Chelsea and Lamont soils are upslope from Fayette soils, but in other places they are downslope.

Typical pedon of Fayette silt loam, 2 to 5 percent slopes, 1,650 feet south and 790 feet east of the northwest corner of sec. 7, T. 72 N., R. 7 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

E—5 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; common fine faint dark grayish brown (10YR 4/2) mottles; weak medium and thick platy structure; friable; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; clear smooth boundary.

BE—9 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium and thick platy structure parting to moderate very fine subangular blocky; friable; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—12 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt2—16 to 24 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) silty clay loam; strong fine subangular blocky and angular blocky structure; friable; common thin nearly continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt3—24 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common thin nearly continuous dark yellowish brown (10YR 4/4) clay

films on faces of peds; medium acid; gradual smooth boundary.

Bt4—30 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable; common thin nearly continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; gradual smooth boundary.

BC—39 to 52 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—52 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine faint dark yellowish brown (10YR 4/4) mottles; massive; friable; few fine segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 36 to 60 inches in thickness.

The A horizon, where present, is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 4 inches or less thick and ranges from slightly acid to strongly acid in unlimed areas. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). It ranges from slightly acid to strongly acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). It ranges from slightly acid to strongly acid. Some pedons do not have an E horizon. The Bt horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/4). It ranges from medium acid to very strongly acid.

Galland Series

The Galland series consists of moderately well drained or somewhat poorly drained, slowly permeable soils on high stream benches. These soils formed in a paleosol derived from medium textured to fine textured, stratified, water-sorted glacial sediments deposited as alluvium during an earlier geological period. These soils developed under a native vegetation of deciduous trees. Slopes range from 5 to 18 percent.

Galland soils are commonly adjacent to Ainsworth, Douds, Lindley, Nordness, and Okaw soils. Ainsworth and Okaw soils have less sand and more silt in the B horizon than Galland soils. Douds soils have less clay and more sand in the B horizon. Lindley soils have less clay in the B horizon, they formed in glacial till, and they do not have stratification throughout the profile. Nordness soils are shallow to bedrock. Ainsworth and Okaw soils are on low stream terraces. Douds and Lindley soils are upslope from Galland soils, and Nordness soils are downslope.

Typical pedon of Galland loam, 9 to 14 percent slopes, moderately eroded, 2,530 feet south and 1,860 feet west of the northeast corner of sec. 7, T. 70 N., R. 6 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; mixed with streaks and pockets of brown (7.5YR 4/4) clay loam subsoil material; moderate fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—8 to 14 inches; brown (7.5YR 4/4) clay loam (36 percent clay); common fine faint reddish brown (5YR 4/3 & 4/4), yellowish red (5YR 4/6), and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few thin patchy reddish brown (5YR 4/3) and dark reddish brown (5YR 3/4) clay films on faces of peds; common fine segregations (iron and manganese oxides); 1 percent small pebbles; strongly acid; gradual smooth boundary.

Bt2—14 to 18 inches; reddish brown (5YR 4/4) clay loam (38 percent clay); common fine and medium distinct brown (7.5YR 5/4) and grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/4) and reddish brown (5YR 4/4) clay films on faces of peds; common fine segregations (iron and manganese oxides); 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt3—18 to 27 inches; strong brown (7.5YR 5/6) clay; common fine and medium distinct brown (10YR 5/3), grayish brown (10YR 5/2), and dark red (2.5YR 3/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous reddish brown (5YR 4/4) and brown (7.5YR 4/4) clay films on faces of peds; common fine segregations (iron and manganese oxides); 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt4—27 to 32 inches; grayish brown (10YR 5/2) and reddish brown (5YR 4/4) clay; common fine and medium distinct dark red (2.5YR 3/6) mottles; moderate medium subangular blocky structure; very firm; common thin discontinuous reddish brown (5YR 4/4) and brown (7.5YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt5—32 to 38 inches; grayish brown (10YR 5/2) clay loam (38 percent clay); common fine distinct reddish brown (5YR 4/4 & 5/4) and yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous brown (7.5YR 5/2) and grayish brown (10YR 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt6—38 to 44 inches; strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) silty clay loam; common fine and medium distinct yellowish red (5YR 4/6) and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/4) and grayish brown (10YR 5/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 5 percent small pebbles; strongly acid; gradual smooth boundary.

BC—44 to 55 inches; yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) clay loam; common fine faint dark grayish brown (10YR 4/2) and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; common fine and medium segregations and concretions (iron and manganese oxides); 2 percent small pebbles; strongly acid; gradual smooth boundary.

C—55 to 60 inches; yellowish brown (10YR 5/6) silt loam; common fine and medium distinct brown (7.5YR 4/4) and light brownish gray (10YR 6/2) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); 2 percent small pebbles; strongly acid.

The solum ranges from 48 to 72 inches in thickness.

The Ap horizon ranges from dark grayish brown (10YR 4/2) to brown (7.5YR 5/2). Texture of the Ap horizon is loam or silt loam. The Ap horizon is strongly acid or medium acid in unlimed areas. In some areas thin A and E horizons are present. The Bt horizon ranges from dark grayish brown (10YR 4/2) to yellowish red (5YR 4/6). Texture of the upper part of the Bt horizon is clay loam, clay, or silty clay. Clay content of the upper part of the Bt horizon ranges from 35 to 48 percent. The Bt horizon ranges from very strongly acid to medium acid. The BC and C horizons range from strong brown (7.5YR 5/6) to grayish brown (10YR 5/2). Texture of the C horizon ranges from sandy loam to clay.

Gara Series

The Gara series consists of moderately well drained or well drained, moderately slowly permeable soils on convex, strongly sloping to moderately steep side slopes of valleys in the uplands. These soils formed in glacial till under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 9 to 18 percent.

Gara soils are similar to Lindley soils and are commonly adjacent to Armstrong, Ladoga, Pershing, and Rinda soils. Lindley soils have a thinner or lighter colored A horizon than Gara soils. Armstrong, Pershing, and Rinda soils have more clay in the B horizon. Ladoga and Pershing soils contain more silt and less sand in the solum. Armstrong, Ladoga, Pershing, and Rinda soils are upslope from Gara soils.

Typical pedon of Gara loam, 14 to 18 percent slopes, 1,780 feet south and 460 feet east of the northwest corner of sec. 28, T. 71 N., R. 5 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; 1 percent small pebbles; slightly acid; clear smooth boundary.

E—7 to 10 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium and thick platy structure; friable; 2 percent small pebbles; medium acid; gradual smooth boundary.

Bt1—10 to 17 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; common thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt2—17 to 22 inches; strong brown (7.5YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable; common thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; common pale brown (10YR 6/3) sand coatings on faces of peds; 2 percent small pebbles; strongly acid; gradual smooth boundary.

Bt3—22 to 27 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common pale brown (10YR 6/3) sand coatings on faces of peds; 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt4—27 to 35 inches; strong brown (7.5YR 5/6) clay loam; few fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; thin nearly continuous dark yellowish brown (10YR 4/4 & 3/4) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt5—35 to 44 inches; strong brown (7.5YR 5/6) clay loam; common fine distinct brown (10YR 5/3) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark yellowish brown (10YR 4/4 & 3/4) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; strongly acid; gradual smooth boundary.

BC—44 to 49 inches; yellowish brown (10YR 5/6) clay loam; common fine faint and distinct strong brown (7.5YR 5/6), brown (7.5YR 4/4), and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; medium acid; gradual smooth boundary.

C—49 to 60 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (2.5Y 5/2), light brownish gray (2.5Y 6/2), and yellowish brown (10YR 5/4) mottles; massive; firm; common fine segregations and concretions (iron and manganese oxides); 2 percent small pebbles; slightly acid.

The solum ranges from 36 to 70 inches in thickness. The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is loam or clay loam, 7 to 9 inches thick, and strongly acid or medium acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) and is strongly acid or medium acid. Some pedons do not have an E horizon. The Bt horizon ranges from brown (10YR 4/3) to strong brown (7.5YR 5/6). The C horizon is dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4 or 5/6) with mottles ranging from light gray (10YR 7/1) to strong brown (7.5YR 5/8). The C horizon ranges from slightly acid to moderately alkaline.

Givin Series

The Givin series consists of somewhat poorly drained, moderately slowly permeable soils on narrow to moderately wide convex ridgetops; on the upper part of side slopes in the loess-covered uplands; and on high, loess-covered stream benches. These soils formed in leached loess under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 0 to 5 percent.

Givin soils are similar to Keomah and Mahaska soils and are commonly adjacent to Hedrick and Ladoga soils. Keomah soils have a thinner or lighter colored A horizon than Givin soils. Mahaska soils have a mollic epipedon. Hedrick soils have less clay in the B horizon. Ladoga soils are higher in chroma in the Bt horizon. Hedrick and Ladoga soils are downslope from Givin soils.

Typical pedon of Givin silt loam, 0 to 2 percent slopes, 2,010 feet south and 150 feet east of the northwest corner of sec. 26, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium platy structure; friable; few very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

BE—11 to 15 inches; brown (10YR 4/3) silty clay loam; common medium faint dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; friable; few very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt1—15 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam (38 percent clay); common fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; thin nearly continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt2—20 to 24 inches; dark grayish brown (10YR 4/2) silty clay (41 percent clay); common fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; thin nearly continuous grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt3—24 to 31 inches; grayish brown (10YR 5/2) silty clay (41 percent clay); common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; thin nearly continuous dark grayish brown (10YR 4/2), dark gray (10YR 4/1), and grayish brown (10YR 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt4—31 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam (37 percent clay); common fine distinct dark grayish brown (10YR 4/2), yellowish brown (10YR 5/4), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin nearly continuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt5—42 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam (37 percent clay); common fine distinct dark grayish brown (10YR 4/2), yellowish brown (10YR 5/4), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—52 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6 & 5/4) mottles; massive; friable; common fine segregations and concretions (iron and manganese oxides); slightly acid.

The solum typically is more than 48 inches thick and ranges from 40 to 72 inches in thickness.

The Ap or A horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). It ranges from strongly acid to slightly acid in unlimed areas. Clay content of the Bt horizon ranges from 36 to 42 percent. The Bt horizon is medium acid or strongly acid.

Grundy Series

The Grundy series consists of somewhat poorly drained, slowly permeable soils on convex ridgetops and the upper part of side slopes in the loess-covered uplands and on high stream benches. They formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 2 to 5 percent.

Grundy soils are similar to Pershing soils and are commonly adjacent to Arispe, Haig, and Pershing soils. Pershing soils do not have a mollic epipedon. Arispe soils have less clay in the Bt horizon than Grundy soils and have more clay in the Ap horizon. Haig soils are lower in chroma in the Bt horizon. Arispe and Pershing soils are downslope from Grundy soils, and Haig soils are upslope on flats.

Typical pedon of Grundy silt loam, 2 to 5 percent slopes, 2,500 feet north and 940 feet east of the southwest corner of sec. 30, T. 70 N., R. 6 W.

Ap—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—10 to 13 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; common black (10YR 2/1) coatings on faces of peds; slightly acid; gradual smooth boundary.

AB—13 to 16 inches; very dark gray (10YR 3/1) silty clay loam (38 percent clay), gray (10YR 5/1) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; firm; common discontinuous black (10YR 2/1) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt—16 to 21 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/4) mottles in the lower part; moderate very fine and fine subangular blocky structure; very firm; common discontinuous very dark gray (10YR 3/1) and black (10YR 2/1) coatings on faces of peds; common thin discontinuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; medium acid; gradual smooth boundary.

Btg1—21 to 29 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common thin discontinuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; common fine segregations (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—29 to 36 inches; grayish brown (2.5Y 5/2) silty clay loam (38 percent clay); common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg3—36 to 41 inches; olive gray (5Y 5/2) silty clay loam (36 percent clay); common fine distinct light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common thin patchy grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BCg—41 to 50 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Cg—50 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and strong brown (7.5YR 5/6) mottles; massive; friable; common fine segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 40 to 72 inches in thickness.

The Ap and A horizons are black (10YR 2/1), very dark brown (10YR 2/2), and very dark gray (10YR 3/1). They are silt loam or silty clay loam and 8 to 17 inches thick. The AB horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It ranges from strongly acid to slightly acid. Clay content of the upper part of the Bt horizon ranges from 42 to 48 percent. The Bt horizon ranges from strongly acid to slightly acid.

Haig Series

The Haig series consists of poorly drained, slowly permeable soils on broad flats on loess-covered upland divides and on high stream benches. These soils formed

in leached loess under a native vegetation of tall prairie grasses. Slopes range from 0 to 2 percent.

Haig soils are similar to Belinda soils and are commonly adjacent to Edina and Grundy soils. Belinda soils do not have a mollic epipedon. Edina soils have an E horizon. Grundy soils are higher in chroma in the Bt horizon than Haig soils. Edina soils are at slightly lower elevations on the flats. Grundy soils are downslope from Haig soils.

Typical pedon of Haig silt loam, 0 to 2 percent slopes, 2,610 feet south and 1,290 feet west of the northeast corner of sec. 25, T. 70 N., R. 7 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—9 to 13 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure parting to weak fine and medium granular; friable; slightly acid; gradual smooth boundary.

AB—13 to 17 inches; very dark gray (10YR 3/1) silty clay loam (39 percent clay), dark gray (10YR 4/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky structure; firm; common discontinuous black (10YR 2/1) coatings on faces of peds; medium acid; gradual smooth boundary.

Btg1—17 to 22 inches; very dark gray (10YR 3/1) and dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common thin nearly continuous very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—22 to 27 inches; dark gray (5Y 4/1) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common thin nearly continuous very dark gray (5Y 3/1), dark gray (5Y 4/1), and olive gray (5Y 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg3—27 to 33 inches; olive gray (5Y 5/2) silty clay; common fine distinct light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; common thin nearly continuous very dark gray (5Y 3/1), olive gray (5Y 5/2), and dark gray (5Y 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg4—33 to 41 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common thin patchy dark gray (5Y 4/1), olive gray (5Y 5/2), and very dark gray (10YR 3/1) clay films on faces of peds and in root channels; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg5—41 to 48 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; common thin patchy dark gray (5Y 4/1), olive gray (5Y 5/2), and very dark gray (5Y 3/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BCg—48 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/4), strong brown (7.5YR 5/6), and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 52 to 72 inches in thickness. The mollic epipedon is 16 to 24 inches thick.

The Ap and A horizons are black (10YR 2/1) or very dark gray (10YR 3/1). They are silt loam or silty clay loam, 8 to 16 inches thick, and medium acid or slightly acid in unlimed areas. The AB horizon is black (10YR 2/1) or very dark gray (10YR 3/1). It is silty clay loam or silty clay. Some pedons do not have an AB horizon. The Btg horizon ranges from very dark gray (10YR 3/1) to light olive gray (5Y 6/2). Clay content of the upper part of the Btg horizon ranges from 40 to 50 percent, and the upper 20 inches of the Btg horizon averages between 42 and 48 percent clay. The Btg horizon is strongly acid or medium acid.

Hedrick Series

The Hedrick series consists of moderately well drained, moderately permeable soils on short, convex and straight side slopes and in coves at the head of drainageways in the loess-covered uplands. These soils formed in leached loess under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 2 to 9 percent.

Hedrick soils are similar to Nira soils and are commonly adjacent to Givin, Ladoga, and Rinda soils. Nira soils have a mollic epipedon. Givin, Ladoga, and

Rinda soils have more clay in the B horizon than Hedrick soils. In addition, Ladoga soils are higher in chroma in the lower part of the B horizon. Givin soils are upslope from Hedrick soils, and Ladoga and Rinda soils typically are downslope.

Typical pedon of Hedrick silt loam, 2 to 5 percent slopes, 960 feet south and 520 feet east of the northwest corner of sec. 17, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few light gray (10YR 7/1) dry silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—8 to 16 inches; brown (10YR 4/3) silty clay loam; few fine faint yellowish brown (10YR 5/6 & 5/4) mottles; moderate fine and medium subangular blocky structure; firm; few very dark grayish brown (10YR 3/2) coatings on faces of peds; common thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt2—16 to 24 inches; brown (10YR 5/3) silty clay loam; common fine distinct grayish brown (2.5Y 5/2), yellowish brown (10YR 5/6), and brown (7.5YR 5/4) mottles; moderate very fine and fine subangular blocky structure; firm; thin nearly continuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; few light gray (10YR 7/1) dry silt coatings on faces of peds; few fine segregations (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt3—24 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct brown (7.5YR 5/4) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky and angular blocky structure; firm; thin nearly continuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt4—34 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium distinct brown (7.5YR 5/4) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; common thin discontinuous dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Bt5—42 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium distinct brown (7.5YR 5/4) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable; common thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

C—50 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/6) and brown (7.5YR 5/4) mottles; massive; friable; common fine segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 36 to 80 inches in thickness.

The Ap or A horizon ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). It is 7 to 9 inches thick and ranges from medium acid to neutral. The E horizon, where present, is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) and ranges from strongly acid to slightly acid. The upper part of the Bt horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4). It ranges from strongly acid to slightly acid. The lower part of the Bt horizon, at a depth of 20 to 36 inches, is gray (10YR 5/1) to light olive gray (5Y 6/2). The Bt horizon ranges from strongly acid to slightly acid.

Hoopeston Series

The Hoopeston series consists of somewhat poorly drained soils on low stream terraces. These soils formed in loamy and sandy alluvial sediments under a native vegetation of prairie grasses. Permeability is moderately rapid or rapid. Slopes range from 0 to 2 percent.

Hoopeston soils are commonly adjacent to Dickinson and Sparta soils. Dickinson and Sparta soils are higher in chroma in the B horizon than Hoopeston soils. Dickinson and Sparta soils are on slightly higher elevations on stream terraces.

Typical pedon of Hoopeston fine sandy loam, 0 to 2 percent slopes, 770 feet north and 2,640 feet west of the southeast corner of sec. 31, T. 73 N., R. 7 W.

Ap—0 to 9 inches; very dark brown (10YR 2/2) fine sandy loam, dark grayish brown (10YR 4/2) dry; moderate very fine and fine granular structure; very friable; neutral; clear smooth boundary.

A—9 to 13 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to moderate very fine and fine granular; very friable; many very dark brown (10YR 2/2) coatings on faces of peds; slightly acid; gradual smooth boundary.

AB—13 to 17 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; common fine faint dark grayish brown (10YR 4/2), brown (10YR 4/3), and grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; very friable; medium acid; gradual smooth boundary.

Bw1—17 to 22 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) fine sandy loam; common fine faint brown (10YR 5/3) and grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bw2—22 to 27 inches; dark grayish brown (10YR 4/2) fine sandy loam; common fine faint brown (10YR 5/3) and grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/6), pale brown (10YR 6/3), and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; very friable; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C1—27 to 34 inches; pale brown (10YR 6/3) and grayish brown (10YR 5/2) loamy fine sand; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; single grained; loose; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C2—34 to 60 inches; grayish brown (10YR 5/2) fine sand; common fine distinct strong brown (7.5YR 5/6), brown (7.5YR 4/4), and yellowish brown (10YR 5/6) mottles; single grained; loose; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 20 to 44 inches in thickness.

The A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is fine sandy loam but ranges from sandy loam to loam. The A horizon ranges from strongly acid to neutral. The Bw horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4) and is mottled throughout. It is fine sandy loam or sandy loam that has thin strata of loam in places. The Bw horizon ranges from strongly acid to neutral.

Kalona Series

The Kalona series consists of poorly drained, moderately slowly permeable soils in the center of broad flats on the loess-covered upland divides and on high stream benches. These soils formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 0 to 1 percent.

Kalona soils are commonly adjacent to Sperry and Taintor soils. Sperry soils have an argillic horizon and an E horizon. Taintor soils have less clay in the Ap horizon than Kalona soils and have an argillic horizon. Sperry soils are in slight depressions. Taintor soils are on the outer edge of large flats, and Kalona soils are in the center of these flats.

Typical pedon of Kalona silty clay loam, 0 to 1 percent slopes, 2,590 feet north and 1,720 feet east of the southwest corner of sec. 10, T. 72 N., R. 5 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam (37 percent clay), very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; firm; neutral; gradual smooth boundary.

A—10 to 14 inches; black (N 2/0) silty clay loam (38 percent clay), very dark gray (10YR 3/1) dry; moderate very fine subangular blocky structure; firm; neutral; gradual smooth boundary.

AB—14 to 17 inches; very dark gray (10YR 3/1) silty clay loam (39 percent clay), dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; firm; common black (N 2/0) coatings on faces of peds; neutral; gradual smooth boundary.

Bg1—17 to 21 inches; dark gray (5Y 4/1) silty clay loam (39 percent clay); common fine faint and distinct olive gray (5Y 5/2), light olive brown (2.5Y 5/4), and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate very fine and fine subangular blocky; firm; common black (10YR 2/1) and very dark gray (10YR 3/1) coatings on faces of peds; neutral; gradual smooth boundary.

Bg2—21 to 28 inches; gray (5Y 5/1) silty clay loam (39 percent clay); common fine faint and distinct light olive gray (5Y 6/2), olive gray (5Y 5/2), light olive brown (2.5Y 5/4), and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common very dark gray (10YR 3/1) coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

Bg3—28 to 35 inches; olive gray (5Y 5/2) silty clay loam (36 percent clay); common fine faint and distinct light olive gray (5Y 6/2), light olive brown (2.5Y 5/4), and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

BCg—35 to 44 inches; light olive gray (5Y 6/2) silty clay loam; common fine faint and distinct olive gray (5Y 5/2), light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine and medium segregations and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

Cg—44 to 60 inches; light olive gray (5Y 6/2) silt loam; common fine faint and distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), light olive brown

(2.5Y 5/4), and olive gray (5Y 5/2) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); mildly alkaline.

The solum ranges from 40 to 72 inches in thickness. The mollic epipedon is 14 to 24 inches thick.

The A horizon is 10 to 16 inches thick. Clay content of the Ap horizon ranges from 36 to 39 percent. The Bg horizon ranges from dark gray (10YR 4/1) to olive gray (5Y 5/2). Clay content of the Bg horizon ranges from 36 to 42 percent. The Cg horizon is olive gray (5Y 5/2 or 4/2) or light olive gray (5Y 6/2). It is silty clay loam or silt loam and is neutral or mildly alkaline.

Keomah Series

The Keomah series consists of somewhat poorly drained, moderately slowly permeable soils on narrow to moderately wide, convex ridgetops in the loess-covered uplands and on high stream benches. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 0 to 5 percent.

Keomah soils are similar to Givin soils and are commonly adjacent to Clinton and Rushville soils. Givin soils have a thicker or darker A horizon than Keomah soils. Clinton soils are higher in chroma in the Bt horizon, and Rushville soils are lower in chroma. Clinton soils are downslope from Keomah soils, and Rushville soils are upslope on flats.

Typical pedon of Keomah silt loam, 0 to 2 percent slopes, 1,600 feet north and 25 feet east of the southwest corner of sec. 16, T. 73 N., R. 7 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

E1—8 to 12 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak thin platy structure; friable; many light gray (10YR 7/2) dry silt coatings on faces of peds; slightly acid; clear smooth boundary.

E2—12 to 15 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint brown (10YR 5/3) mottles; weak medium platy structure; friable; many light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—15 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings on faces of peds; common thin discontinuous grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay films on faces of peds; many light gray (10YR 7/2) dry silt coatings on faces of peds; few fine segregations (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt2—18 to 25 inches; dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) silty clay loam (39 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate very fine and fine subangular blocky; firm; common thin discontinuous grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt3—25 to 30 inches; grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) silty clay loam (38 percent clay); common fine distinct dark grayish brown (10YR 4/2), yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common thin discontinuous grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt4—30 to 41 inches; grayish brown (10YR 5/2) silty clay loam (38 percent clay); common fine and medium distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; common thin discontinuous grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg—41 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few thin patchy grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

BCg—50 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; common fine and medium segregations and

concretions (iron and manganese oxides); strongly acid.

The solum ranges from 40 to 76 inches in thickness.

The A horizon, where present, is very dark gray (10YR 3/1). The A horizon is 3 inches or less in thickness and is medium acid or slightly acid. The Ap horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). The Ap horizon ranges from strongly acid to slightly acid in unlimed areas. Some pedons do not have an Ap horizon. The E horizon ranges from dark gray (10YR 4/1) to brown (10YR 5/3). The E horizon ranges from strongly acid to slightly acid. Some pedons do not have an E horizon. The upper part of the Bt horizon is dark yellowish brown (10YR 4/4) or yellowish brown (10YR 5/4). It is silty clay loam or silty clay. Clay content of the upper 20 inches of the Bt horizon averages between 36 and 42 percent.

Keswick Series

The Keswick series consists of moderately well drained, slowly permeable soils on short, convex side slopes and convex nose slopes in the uplands. These soils formed in a paleosol that formed in glacial till under a native vegetation of deciduous trees. Slopes range from 9 to 18 percent.

Keswick soils are similar to Armstrong soils and are commonly adjacent to Ashgrove, Clinton, Lindley, and Weller soils. Armstrong soils have a thicker or darker A horizon than Keswick soils. Ashgrove soils are lower in chroma in the B horizon. Clinton and Weller soils have more silt and less sand. Lindley soils have less clay in the Bt horizon. Ashgrove, Clinton, and Weller soils are upslope from Keswick soils, and Lindley soils are downslope.

Typical pedon of Keswick loam, 9 to 14 percent slopes, moderately eroded, 530 feet north and 1,410 feet west of the southeast corner of sec. 30, T. 71 N., R. 7 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; mixed with some streaks and pockets of strong brown (7.5YR 5/6) clay loam subsoil material; moderate fine granular structure; friable; strongly acid; abrupt smooth boundary.

2Bt1—5 to 9 inches; strong brown (7.5YR 5/6) clay loam (38 percent clay); common fine distinct yellowish red (5YR 4/6) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/4) and reddish brown (5YR 4/4) clay films on faces of peds; 2 percent small pebbles; very strongly acid; clear smooth boundary.

2Bt2—9 to 16 inches; reddish brown (5YR 4/4) clay; common fine distinct dark red (2.5YR 3/6), grayish brown (10YR 5/2), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to strong fine and medium subangular blocky; very firm; thin nearly continuous brown (7.5YR 4/4) and reddish brown (5YR 4/4) clay films on faces of peds; 4 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt3—16 to 24 inches; strong brown (7.5YR 5/6) clay; common fine and medium distinct grayish brown (10YR 5/2), dark red (2.5YR 3/6), red (2.5YR 4/8), and brown (7.5YR 5/4) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin nearly continuous brown (7.5YR 4/4) and reddish brown (5YR 4/4) clay films on faces of peds; 3 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt4—24 to 31 inches; strong brown (7.5YR 5/6) clay; common fine and medium distinct yellowish red (5YR 4/6) and grayish brown (2.5Y 5/2) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt5—31 to 38 inches; strong brown (7.5YR 5/6) clay (42 percent clay); common fine and medium distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; 4 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt6—38 to 47 inches; yellowish brown (10YR 5/6) clay loam (38 percent clay); common fine and medium distinct grayish brown (2.5Y 5/2) and strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; firm; common thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; very strongly acid; gradual smooth boundary.

2Bt7—47 to 60 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium distinct strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; firm; common thin patchy brown (7.5YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; very strongly acid.

The solum ranges from 42 to 72 inches in thickness.

The A horizon, where present, is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is loam or silt loam, 5 inches or less in thickness, and strongly acid or medium acid in unlimed areas. The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2).

It is loam, silt loam, or clay loam. Some pedons do not have an Ap horizon. The E horizon, where present, ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3) and is loam or silt loam. The 2Bt horizon ranges from reddish brown (5YR 4/3) to strong brown (7.5YR 5/6). It is clay loam or clay. Clay content of the upper 20 inches of the 2Bt horizon ranges from 35 to 48 percent. The 2Bt horizon ranges from medium acid to very strongly acid.

Klum Series

The Klum series consists of moderately well drained, moderately rapidly permeable soils on bottom lands. These soils formed in stratified loamy and sandy alluvium. Slopes range from 0 to 3 percent.

Klum soils are commonly adjacent to Lawson, Nodaway, and Perks soils. Lawson and Nodaway soils have less sand and more silt and clay in the control section than Klum soils. Perks soils have more sand and less clay. Lawson and Nodaway soils are on slightly lower elevations on the bottom lands. Perks soils are on slightly higher elevations.

Typical pedon of Klum fine sandy loam, 0 to 2 percent slopes, 160 feet north and 1,240 feet west of the southeast corner of sec. 22, T. 70 N., R. 6 W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; very friable; neutral; gradual smooth boundary.

C1—7 to 16 inches; stratified dark brown (10YR 3/3) and brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure parting to moderate fine and medium granular; very friable; very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2) dry, coatings on faces of peds; neutral; gradual smooth boundary.

C2—16 to 27 inches; stratified brown (10YR 4/3) and dark brown (10YR 3/3) loamy fine sand; weak fine and medium subangular blocky structure; very friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; gradual smooth boundary.

C3—27 to 40 inches; stratified brown (10YR 4/3) and dark grayish brown (10YR 4/2) sandy loam; weak medium subangular blocky structure; very friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; gradual smooth boundary.

C4—40 to 60 inches; dark grayish brown (10YR 4/2) sandy loam; weak medium subangular blocky structure; very friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral.

The solum ranges from 6 to 10 inches in thickness.

The A horizon is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), and dark brown (10YR 3/3). It is fine sandy loam, sandy loam, or loamy fine sand. The A horizon is 6 to 10 inches thick. The C horizon is stratified brown (10YR 4/3), dark brown (10YR 3/3), dark gray (10YR 4/1), grayish brown (10YR or 2.5Y 5/2), and dark grayish brown (10YR 4/2). It is loamy fine sand, sand, loamy sand, silt loam, sandy loam, or fine sandy loam. The C horizon is neutral or mildly alkaline.

Ladoga Series

The Ladoga series consists of moderately well drained, moderately permeable soils on convex ridgetops and side slopes in the loess-covered uplands and on high, loess-covered stream benches. These soils formed in leached loess under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 2 to 14 percent.

Ladoga soils are similar to Clinton and Otley soils and are commonly adjacent to Armstrong, Gara, Givin, Hedrick, Lineville, and Rinda soils. Clinton soils have a thinner or lighter colored A horizon than Ladoga soils. Otley soils have a mollic epipedon. Armstrong, Gara, Lineville, and Rinda soils have more sand and less silt. Givin and Rinda soils are lower in chroma in the Bt horizon. Hedrick soils contain less clay in the Bt horizon and are lower in chroma in the lower part of the Bt horizon. Givin and Hedrick soils are upslope from Ladoga soils, and Armstrong, Gara, Lineville, and Rinda soils are downslope.

Typical pedon of Ladoga silt loam, 2 to 5 percent slopes, 1,920 feet south and 210 feet east of the northwest corner of sec. 26, T. 73 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

E—9 to 12 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common fine faint brown (10YR 4/3) mottles; moderate medium platy structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bt1—12 to 16 inches; brown (10YR 4/3) silty clay loam; moderate very fine and fine subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2), brown (10YR 4/3), and dark brown (10YR 3/3) clay films on faces of peds; common grayish brown (10YR 5/2) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt2—16 to 21 inches; brown (10YR 4/3) silty clay loam (37 percent clay); moderate medium prismatic structure parting to moderate fine subangular blocky; firm; thin nearly continuous brown (10YR 4/3), dark

grayish brown (10YR 4/2), and dark brown (10YR 3/3) clay films on faces of peds; common grayish brown (10YR 5/2) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt3—21 to 31 inches; brown (10YR 4/3) silty clay loam (38 percent clay); moderate medium prismatic structure parting to moderate fine and medium subangular blocky; firm; thin nearly continuous brown (10YR 4/3), dark grayish brown (10YR 4/2), and dark brown (10YR 3/3) clay films on faces of peds; common grayish brown (10YR 5/2) silt coatings on faces of peds; medium acid; gradual smooth boundary.

Bt4—31 to 40 inches; yellowish brown (10YR 5/4) silty clay loam (37 percent clay); common fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common grayish brown (10YR 5/2) silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

BC—40 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2), light brownish gray (10YR 6/2), and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and light brownish gray (10YR 6/2) mottles; massive; friable; common fine segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 36 to 72 inches in thickness.

The A or Ap horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is 7 to 9 inches thick and is medium acid or slightly acid in unlimed areas. The E horizon ranges from strongly acid to slightly acid. Some pedons do not have an E horizon. The Bt horizon is silty clay loam or silty clay. Clay content of the upper 20 inches of the Bt horizon averages between 36 and 42 percent. The C horizon ranges from yellowish brown (10YR 5/4) to olive gray (5Y 5/2) and is silt loam or silty clay loam.

Lamont Series

The Lamont series consists of well drained, moderately rapidly permeable soils on uplands and stream terraces. These soils formed in sandy eolian deposits under a native vegetation of deciduous trees. Slopes range from 2 to 25 percent.

Lamont soils are commonly adjacent to Ainsworth, Chelsea, and Fayette soils. Ainsworth and Fayette soils have more silt and clay and less sand than Lamont soils. Chelsea soils have less clay in the B horizon. Ainsworth soils are on slightly lower elevations on the stream terraces. Chelsea and Fayette soils are downslope from Lamont soils in some places and upslope in other places in the uplands.

Typical pedon of Lamont fine sandy loam, 2 to 5 percent slopes, 1,200 feet north and 2,380 feet west of the southeast corner of sec. 20, T. 70 N., R. 5 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; very friable; medium acid; clear smooth boundary.

E—8 to 13 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium and thick platy structure; very friable; medium acid; gradual smooth boundary.

Bt1—13 to 27 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; thin discontinuous brown (7.5YR 4/4) clay films connecting some sand grains; common pale brown (10YR 6/3) sand coatings on faces of peds; medium acid; gradual smooth boundary.

Bt2—27 to 40 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; very friable; few thin patchy brown (7.5YR 4/4) clay films connecting some sand grains; medium acid; gradual smooth boundary.

E&Bt—40 to 60 inches; yellowish brown (10YR 5/6) loamy fine sand (E); single grained; loose; few brown (10YR 4/3) and dark yellowish brown (10YR 4/4) fine sandy loam (Bt) lamellae 1/2 to 1 inch thick; medium acid.

The solum ranges from 30 to 60 inches or more in thickness.

The Ap or A horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). Where the value is 3, the horizon is less than 6 inches thick. The Ap or A horizon is 2 to 10 inches thick and ranges from strongly acid to neutral. The Bt horizon ranges from brown (10YR 4/3) to reddish yellow (7.5YR 6/6). It is fine sandy loam, loam, or sandy loam and is medium acid or strongly acid.

Lawson Series

The Lawson series consists of somewhat poorly drained, moderately permeable soils on bottom lands. These soils formed in stratified silty alluvium. Slopes range from 0 to 2 percent.

Lawson soils are similar to Colo and Nodaway soils and are commonly adjacent to Colo, Klum, Nodaway, and Perks soils. Colo soils contain more clay in the

control section than Lawson soils and have a thicker mollic epipedon. Nodaway and Perks soils do not have a mollic epipedon. Klum and Perks soils contain more sand and less clay in the control section. Colo and Nodaway soils typically are on slightly lower elevations than Lawson soils, and Klum and Perks soils are on slightly higher elevations.

Typical pedon of Lawson silt loam, 0 to 2 percent slopes, 1,250 feet south and 1,850 feet west of the northeast corner of sec. 20, T. 70 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; neutral; gradual smooth boundary.

A1—9 to 18 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to moderate fine and medium granular; friable; neutral; gradual smooth boundary.

A2—18 to 30 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure; friable; neutral; gradual smooth boundary.

C1—30 to 40 inches; stratified dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), and dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; neutral; gradual smooth boundary.

C2—40 to 60 inches; stratified very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam; massive; friable; neutral.

The solum ranges from 24 to 36 inches in thickness.

The A horizon is black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is 24 to 36 inches thick and is slightly acid or neutral. The C horizon is stratified dark grayish brown (10YR 4/2), dark brown (10YR 3/3), brown (10YR 4/3), grayish brown (10YR 5/2), very dark grayish brown (10YR 3/2), or very dark gray (10YR 3/1). Texture of the C horizon is stratified silt loam. Thin strata of silty clay loam, loam, sandy loam, or clay loam below a depth of 40 inches are common.

Lindley Series

The Lindley series consists of well drained, moderately slowly permeable soils on convex, narrow ridgetops and nose slopes and on side slopes of valleys in the uplands. These soils formed in glacial till under a native vegetation of deciduous trees. Slopes range from 9 to 40 percent.

Lindley soils are similar to Gara soils and are commonly adjacent to Ashgrove, Cantril, Clinton, Galland, Keswick, Nordness, and Weller soils. Gara soils have a thicker or darker A horizon than Lindley soils. Ashgrove, Clinton, Galland, Keswick, and Weller soils have more clay in the Bt horizon. Ashgrove, Cantril, Galland, Keswick, and Weller soils have lower chroma in the B horizon. Nordness soils are shallow to bedrock. Clinton and Weller soils have less sand throughout the solum. Ashgrove, Clinton, Keswick, and Weller soils are upslope from the Lindley soils, and Cantril, Galland, and Nordness soils are downslope.

Typical pedon of Lindley loam, 18 to 25 percent slopes, 2,560 feet north and 880 feet east of the southwest corner of sec. 28, T. 71 N., R. 7 W.

A—0 to 3 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; 2 percent small pebbles; slightly acid; abrupt smooth boundary.

E—3 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate very thin and thin platy structure; friable; 2 percent small pebbles; medium acid; abrupt smooth boundary.

BE—9 to 13 inches; yellowish brown (10YR 5/4) clay loam; moderate very fine and fine subangular blocky structure; friable; few thin patchy brown (10YR 4/3) clay films on faces of peds; 2 percent small pebbles; medium acid; gradual smooth boundary.

Bt1—13 to 22 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; firm; common thin discontinuous brown (10YR 4/3) clay films on faces of peds; 4 percent small pebbles; strongly acid; gradual smooth boundary.

Bt2—22 to 33 inches; yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; firm; common thin discontinuous brown (10YR 4/3) clay films on faces of peds; 3 percent small pebbles; strongly acid; gradual smooth boundary.

Bt3—33 to 40 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common thin discontinuous brown (10YR 4/3) clay films on faces of peds; 3 percent small pebbles; medium acid; gradual smooth boundary.

Bt4—40 to 45 inches; yellowish brown (10YR 5/6) clay loam; weak medium subangular blocky structure; firm; few thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; medium acid; gradual smooth boundary.

C—45 to 60 inches; yellowish brown (10YR 5/6) loam; massive; firm; common fine segregations and concretions (iron and manganese oxides); 3 percent small pebbles; common fine and medium segregations and concretions (calcium carbonates); strong effervescence; mildly alkaline.

The solum ranges from 30 to 50 inches in thickness.

The A horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). It is loam or clay

loam, 4 inches thick or less, and ranges from strongly acid to slightly acid in unlimed areas. Some pedons do not have an A horizon. The Ap horizon, if there is one, is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It is loam or clay loam and ranges from strongly acid to slightly acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). It is loam or clay loam and ranges from strongly acid to slightly acid. Some pedons do not have an E horizon. The Bt horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/6). It ranges from strongly acid to slightly acid. The C horizon ranges from medium acid to moderately alkaline below a depth of about 3 feet. It is loam or clay loam.

Lineville Series

The Lineville series consists of moderately well drained or somewhat poorly drained soils on short, convex side slopes in the uplands. These soils formed in leached loess 10 to 20 inches thick, underlain by water-sorted sediments and weathered glacial till, under a native vegetation of mixed tall prairie grasses and deciduous trees. Permeability is moderately slow in the upper part and slow or very slow in the lower part. Slopes range from 9 to 14 percent.

Lineville soils are commonly adjacent to Armstrong and Ladoga soils. Armstrong soils have more clay in the upper 20 inches of the argillic horizon than Lineville soils. Ladoga soils have less clay and less sand in the lower part of the B horizon. Armstrong soils are downslope from Lineville soils, and Ladoga soils are upslope.

Typical pedon of Lineville silt loam, 9 to 14 percent slopes, moderately eroded, 1,920 feet south and 60 feet west of the northeast corner of sec. 22, T. 73 N., R. 5 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; some streaks and pockets of brown (10YR 4/3) silty clay loam subsoil material; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

Bt1—7 to 12 inches; brown (10YR 4/3) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; common thin discontinuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—12 to 16 inches; brown (10YR 4/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate very fine and fine subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

2Bt3—16 to 23 inches; brown (10YR 5/3) silty clay loam high in sand; common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Bt4—23 to 29 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2), dark gray (10YR 4/1), and very dark grayish brown (10YR 3/2) clay films on faces of peds; common light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Bt5—29 to 40 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) clay loam; common fine distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous dark grayish brown (10YR 4/2), dark gray (10YR 4/1), and very dark grayish brown (10YR 3/2) clay films on faces of peds; common light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

3Bt6—40 to 52 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous dark yellowish brown (10YR 4/4) and dark brown (10YR 3/3) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 3 percent pebbles; medium acid; gradual smooth boundary.

3Bt7—52 to 60 inches; strong brown (7.5YR 5/6) clay; common fine distinct red (10R 4/6) and yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin discontinuous dark yellowish brown (10YR 4/4) and dark brown (10YR 3/3) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); 5 percent small pebbles; slightly acid.

The solum ranges from 60 to 80 inches in thickness.

The Ap or A horizon is very dark gray (10YR 3/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The A or Ap horizon is 7 to 9 inches thick and is medium acid or slightly acid in unlimed areas. The E horizon, where present, ranges from dark grayish brown (10YR 4/2) to brown (10YR 5/3). The E horizon ranges from strongly acid to slightly acid. The 2Bt horizon ranges from dark grayish brown (10YR 4/2) to yellowish brown (10YR 5/4). Texture is loam or clay loam. The 2Bt horizon ranges from strongly acid to medium acid in reaction. The 3Bt horizon ranges from yellowish brown (10YR 5/6) to reddish brown (5YR 4/4). It ranges from medium acid to neutral in reaction.

Mahaska Series

The Mahaska series consists of somewhat poorly drained, moderately permeable soils on the outer edge of moderately broad to broad flats. These soils are also in the gently sloping coves at the head of drainageways in the loess-covered uplands and on high stream benches. They formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 0 to 5 percent.

Mahaska soils are similar to Givin soils and are commonly adjacent to Nira, Otley, and Taintor soils. Givin soils do not have a mollic epipedon. Nira soils have less clay in the Bt horizon than Mahaska soils. Otley soils have higher chroma in the Bt horizon. Taintor soils have lower chroma in the Bt horizon. Nira and Otley soils are downslope from Mahaska soils, and Taintor soils are upslope on the flats.

Typical pedon of Mahaska silty clay loam, 0 to 2 percent slopes, 400 feet north and 520 feet east of the southwest corner of sec. 3, T. 72 N., R. 5 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

A—10 to 15 inches; black (10YR 2/1) silty clay loam (36 percent clay), dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to moderate fine and medium granular; friable; slightly acid; gradual smooth boundary.

AB—15 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam (37 percent clay), brown (10YR 5/3) dry; common fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; firm; common black (10YR 2/1) coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—20 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam (38 percent clay); common fine faint brown (10YR 4/3) mottles; moderate very fine and fine subangular blocky structure; firm; common black (10YR 2/1) and very dark grayish brown (10YR 3/2) coatings on faces of peds; common thin discontinuous dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—24 to 29 inches; dark grayish brown (10YR 4/2) silty clay loam (39 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; thin continuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt3—29 to 34 inches; grayish brown (2.5Y 5/2) silty clay loam (36 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium subangular blocky structure; firm; thin continuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt4—34 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam (36 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt5—38 to 45 inches; grayish brown (2.5Y 5/2) silty clay loam (36 percent clay); common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few thin patchy grayish brown (2.5Y 5/2) and dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BC—45 to 51 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

C—51 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 48 to 72 inches in thickness. The mollic epipedon is 14 to 24 inches thick.

The Ap and A horizons are black (10YR 2/1), very dark brown (10YR 2/2), and very dark gray (10YR 3/1). They are 8 to 18 inches thick and are strongly acid or medium acid in unlimed areas. Most pedons have an AB horizon. Some pedons have a BA horizon. The Bt horizon ranges from dark grayish brown (10YR 4/2) or brown (10YR 4/3) to grayish brown (2.5Y 5/2). It is silty clay or silty clay loam. Clay content of the Bt horizon ranges from 36 to 42 percent. The Bt horizon is slightly acid or medium acid. The C horizon is silt loam or silty clay loam.

Nevin Series

The Nevin series consists of somewhat poorly drained, moderately permeable soils on low stream terraces. These soils formed in silty alluvium under a native vegetation of prairie grasses. Slopes range from 0 to 2 percent.

Nevin soils are commonly adjacent to Richwood soils. Richwood soils are higher in chroma and have less clay in the Bt horizon than Nevin soils. They are on slightly higher elevations on stream terraces.

Typical pedon of Nevin silty clay loam, 0 to 2 percent slopes, 1,350 feet south and 1,780 feet east of the northwest corner of sec. 30, T. 73 N., R. 7 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—9 to 18 inches; very dark gray (10YR 3/1) and black (10YR 2/1) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; slightly acid; gradual smooth boundary.

BA—18 to 21 inches; very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) silty clay loam; weak medium subangular blocky structure; friable; slightly acid; gradual smooth boundary.

Bt1—21 to 27 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt2—27 to 35 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silty clay loam; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bt3—35 to 46 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common thin discontinuous very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BC—46 to 52 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silty clay loam; common fine distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

C—52 to 60 inches; grayish brown (10YR 5/2) silt loam; common fine distinct brown (7.5YR 4/4), dark grayish brown (10YR 4/2), and strong brown (7.5YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 36 to 60 inches in thickness.

The A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). The A horizon is 15 to 20 inches thick and ranges from medium acid to neutral. The Bt horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (2.5Y 5/2) and is medium acid or slightly acid. The C horizon is silt loam or silty clay loam.

Nira Series

The Nira series consists of moderately well drained, moderately permeable soils on short, convex side slopes and in coves at the head of drainageways in the loess-covered uplands. These soils formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 5 to 9 percent.

Nira soils are similar to Hedrick soils and are commonly adjacent to Adair, Clarinda, Mahaska, and Otley soils. Hedrick soils do not have a mollic epipedon. Adair and Clarinda soils have more sand and less silt than Nira soils, and Clarinda soils are lower in chroma in the B horizon. Adair, Clarinda, Mahaska, and Otley soils have more clay in the Bt horizon. Otley soils are higher in chroma in the lower part of the B horizon. Mahaska soils are upslope from Nira soils, and Adair, Clarinda, and Otley soils are downslope.

Typical pedon of Nira silty clay loam, 5 to 9 percent slopes, 800 feet north and 120 feet east of the southwest corner of sec. 3, T. 72 N., R. 5 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

AB—8 to 13 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; few fine faint brown (10YR 4/3) mottles; moderate very fine subangular blocky structure; friable; common black (10YR 2/1) coatings on faces of peds; medium acid; gradual smooth boundary.

Bw1—13 to 20 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; common very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) coatings on faces of peds; medium acid; gradual smooth boundary.

Bw2—20 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bw3—24 to 33 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common fine and medium segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Bw4—33 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BC—40 to 47 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and light olive brown (2.5Y 5/4) mottles; weak medium subangular blocky structure; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

C—47 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and light olive brown (2.5Y 5/4) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 30 to 50 inches in thickness. The mollic epipedon is 10 to 15 inches thick.

The A horizon is medium acid or slightly acid in unlimed areas. The upper part of the Bw horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/6). The Bw horizon is medium acid or slightly acid. The lower part of the Bw horizon, at a depth of 20 to 30 inches, is gray (2.5Y 5/1) to light olive gray (5Y 6/2). The BC horizon is medium acid to neutral.

Map unit 570C2 is taxadjunct to the Nira series because it does not have a mollic epipedon that is defined in the range for the Nira series.

Nodaway Series

The Nodaway series consists of moderately well drained, moderately permeable soils on bottom lands. These soils formed in stratified silty alluvium. Slopes range from 0 to 3 percent.

Nodaway soils are similar to Lawson soils and are commonly adjacent to Cantril, Colo, Coppock, Klum, Lawson, Perks, Tuskeego, and Vesser soils. Lawson soils have a mollic epipedon. Cantril soils have an argillic horizon and contain more clay and sand in their control section than Nodaway soils. Colo soils have a mollic epipedon and contain more clay in the control section. Coppock, Tuskeego, and Vesser soils have an E and Bt horizon and Vesser soils have a mollic epipedon. Klum and Perks soils contain less clay and more sand in the control section. Cantril soils are upslope on foot slopes. Coppock, Klum, Lawson, Perks, Tuskeego, and Vesser soils are at the slightly higher elevations, and Colo soils are at the slightly lower elevations.

Typical pedon of Nodaway silt loam, 0 to 2 percent slopes, 600 feet north and 1,780 feet west of the southeast corner of sec. 28, T. 70 N., R. 5 W.

A—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

C—8 to 60 inches; stratified dark grayish brown (10YR 4/2), brown (10YR 4/3), and grayish brown (10YR 5/2) silt loam; massive, but tending to have some weak thin platy structure because of stratification; friable; few thin strata of very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) silt loam; neutral.

The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 6 to 10 inches thick and is slightly acid or neutral. The C horizon is stratified dark grayish brown (10YR 4/2), dark brown (10YR 3/3), brown (10YR 4/3), grayish brown (10YR 5/2), very dark grayish brown (10YR 3/2), or very dark gray (10YR 3/1). It is stratified silt loam that contains thin strata of silty clay loam, sandy loam, and clay loam.

Nordness Series

The Nordness series consists of shallow, well drained, moderately permeable soils on side slopes and terrace escarpments on uplands of the major streams and rivers.

These soils formed in 8 to 20 inches of silty material underlain by limestone bedrock under a native vegetation of deciduous trees. Slopes range from 9 to 40 percent.

Nordness soils are commonly adjacent to Douds, Galland, and Lindley soils. Douds, Galland, and Lindley soils are deep soils that do not have bedrock in their profile. These soils typically are upslope from Nordness soils; however, in places Douds and Galland soils are downslope.

Typical pedon of Nordness silt loam, 14 to 25 percent slopes, 2,370 feet south and 930 feet west of the northeast corner of sec. 25, T. 71 N., R. 7 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; neutral; abrupt smooth boundary.

E—2 to 5 inches; dark grayish brown (10YR 4/2) and brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) and pale brown (10YR 6/3) dry; weak medium platy structure parting to weak fine subangular blocky; friable; few very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; clear smooth boundary.

Bt1—5 to 9 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine faint brown (7.5YR 5/4) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common thin discontinuous brown (10YR 4/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; slightly acid; clear smooth boundary.

2Bt2—9 to 15 inches; brown (7.5YR 4/4) silty clay loam; common fine faint strong brown (7.5YR 5/6), yellowish brown (10YR 5/8), and reddish brown (5YR 4/4) mottles; moderate very fine and fine subangular blocky structure; firm; common thin discontinuous dark yellowish brown (10YR 4/4) and brown (10YR 4/3) clay films on faces of peds; few light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; abrupt smooth boundary.

2R—15 inches; hard fractured level-bedded limestone bedrock.

The solum ranges from 8 to 20 inches in thickness. The A or Ap horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). Value of 3 is restricted to a depth of 4 inches or less. The A horizon is 1 to 4 inches thick. The Ap horizon, where present, is 7 to 10 inches thick. The A or Ap horizon ranges from neutral to medium acid. The E horizon is 1 to 4 inches thick and ranges from neutral to medium acid. Some pedons do not have an E horizon. The B and 2B horizons range from brown (10YR 4/3) to reddish brown (5YR 4/4) and range from neutral to medium acid. They are 4 to 12 inches thick.

Okaw Series

The Okaw series consists of poorly drained, very slowly permeable soils on low stream terraces along the major streams. These soils formed in moderately fine textured and fine textured alluvium under a native vegetation of deciduous trees. Slopes range from 0 to 5 percent.

These soils are taxadjuncts to the Okaw series because they do not have an abrupt textural change that is defined in the range for the Okaw series. This difference, however, does not alter the use or behavior of the soils.

The Okaw soils are commonly adjacent to Ainsworth and Galland soils. Ainsworth soils are higher in chroma and have less clay in the Bt horizon than Okaw soils. Galland soils are higher in chroma and have more sand in the Bt horizon. Ainsworth soils are at the slightly higher elevations. Galland soils are upslope from the Okaw soils on high stream benches, and Ainsworth soils are on low stream terraces.

Typical pedon of Okaw silt loam, 0 to 2 percent slopes, 2,610 feet south and 1,350 feet east of the northwest corner of sec. 28, T. 71 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; slightly acid; clear smooth boundary.

Eg1—7 to 10 inches; grayish brown (2.5Y 5/2) silt loam, light gray (2.5Y 7/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate medium granular; friable; common dark grayish brown (10YR 4/2) coatings on faces of peds; slightly acid; clear smooth boundary.

Eg2—10 to 18 inches; light brownish gray (2.5Y 6/2) silt loam, white (2.5Y 8/2) dry; common fine distinct yellowish brown (10YR 5/6), grayish brown (2.5Y 5/2), and light olive brown (2.5Y 5/4) mottles; moderate thin and medium platy structure; friable; few dark grayish brown (10YR 4/2) coatings on faces of peds; few very fine and fine segregations and concretions (iron and manganese oxides); medium acid; clear smooth boundary.

Eg3—18 to 22 inches; grayish brown (2.5Y 5/2) silty clay loam, light gray (2.5Y 7/2) dry; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; many light gray (10YR 7/1) dry silt coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

BEg—22 to 26 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common light

gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg1—26 to 30 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—30 to 38 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), light brownish gray (2.5Y 6/2), and light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common light gray (10YR 7/1) dry silt coatings on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—38 to 48 inches; light brownish gray (2.5Y 6/2) silty clay; common fine distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and grayish brown (2.5Y 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

BCg—48 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), light olive brown (2.5Y 5/4), and light brownish gray (2.5Y 6/2) mottles; very weak medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 45 to 70 inches in thickness.

The Ap or A horizon ranges from dark grayish brown (10YR 4/2) to light brownish gray (10YR 6/2). It is 5 to 7 inches thick and ranges from very strongly acid to slightly acid in unlimed areas. The E horizon ranges from gray (10YR 5/1) to light gray (2.5Y 7/2) and ranges from very strongly acid to slightly acid. The Btg horizon ranges from dark grayish brown (10YR 4/2) to gray (5Y 6/1) and ranges from extremely acid to medium acid.

Otley Series

The Otley series consists of moderately well drained, moderately permeable soils on convex ridgetops and upper side slopes in the loess-covered uplands and on high stream benches. These soils formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 2 to 9 percent.

Otley soils are similar to Ladoga soils and are commonly adjacent to Adair, Clarinda, Mahaska, and Nira soils. Ladoga soils do not have a mollic epipedon. Adair and Clarinda soils have more sand and less silt than Otley soils. Clarinda and Mahaska soils are lower in chroma in the Bt horizon. Nira soils contain less clay in the B horizon and are lower in chroma in the lower part of B and BC horizons. Mahaska and Nira soils are upslope from Otley soils, and Adair and Clarinda soils are downslope.

Typical pedon of Otley silty clay loam, 2 to 5 percent slopes, 2,500 feet north and 40 feet west of the southeast corner of sec. 1, T. 72 N., R. 5 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure parting to moderate fine granular; friable; common black (10YR 2/1) coatings on faces of peds; slightly acid; gradual smooth boundary.

AB—13 to 17 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine and fine subangular blocky structure; friable; common very dark brown (10YR 2/2) and black (10YR 2/1) coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—17 to 21 inches; brown (10YR 4/3) silty clay loam (37 percent clay); moderate very fine and fine subangular blocky structure; firm; common very dark grayish brown (10YR 3/2) coatings on faces of peds; common thin discontinuous dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—21 to 25 inches; brown (10YR 4/3) silty clay loam (37 percent clay); few fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), and dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—25 to 29 inches; yellowish brown (10YR 5/4) silty clay loam (37 percent clay); common fine distinct yellowish brown (10YR 5/6), brown (10YR 4/3), and grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), and dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt4—29 to 35 inches; yellowish brown (10YR 5/4) silty clay loam (36 percent clay); common fine faint yellowish brown (10YR 5/6), brown (10YR 4/3), and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt5—35 to 41 inches; yellowish brown (10YR 5/4) and grayish brown (2.5Y 5/2) silty clay loam (32 percent clay); common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BC—41 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

C—50 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and yellowish red (5YR 4/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 48 to 72 inches in thickness. The mollic epipedon is 10 to 20 inches thick.

The A horizon ranges from black (10YR 2/1) to dark brown (10YR 3/3). It is 10 to 20 inches thick and is strongly acid or medium acid in unlimed areas. Clay content of the Bt horizon ranges from 36 to 42 percent. The Bt horizon is strongly acid and medium acid. The lower part of the Bt horizon has gray mottles, and at a depth of more than 30 inches it can have a gray matrix. The BC horizon ranges from gray (2.5Y 5/1) to olive gray (5Y 6/2). The BC horizon ranges from strongly acid to slightly acid.

Map units 281C2 and 881C2 are taxadjuncts to the Otley series because they do not have a mollic epipedon that is defined in the range for the Otley series.

Perks Series

The Perks series consists of excessively drained, rapidly permeable soils on bottom lands. These soils formed in sandy alluvium that is more than 6 feet thick under a native vegetation of cottonwoods, elms, willows, and some hardwoods. Slopes range from 1 to 3 percent.

Perks soils are commonly adjacent to Klum, Lawson, and Nodaway soils. Klum, Lawson, and Nodaway soils have less sand and more clay in the control section than Perks soils. Lawson and Nodaway soils contain more silt in the control section. Klum, Lawson, and Nodaway soils typically are at the slightly lower elevations.

Typical pedon of Perks loamy sand, in an area of Klum-Perks-Nodaway complex, 1 to 3 percent slopes, 450 feet south and 990 feet east of the northwest corner of sec. 25, T. 70 N., R. 6 W.

Ap—0 to 6 inches; brown (10YR 4/3) loamy sand, brown (10YR 5/3) dry; very weak fine granular structure parting to single grained; loose; medium acid; clear smooth boundary.

C1—6 to 27 inches; stratified brown (10YR 5/3) sand, single grained; loose; few thin strata of dark brown (10YR 4/3) sandy loam; medium acid; clear smooth boundary.

C2—27 to 60 inches; stratified dark brown (10YR 4/3) and brown (10YR 5/3) sand; single grained; loose; few thin strata of dark brown (10YR 4/3) sandy loam; medium acid.

The A horizon is brown (10YR 4/3), dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), or dark brown (10YR 3/3). It is 5 to 9 inches thick and typically is medium acid in unlimed areas. The C horizon ranges from brown (10YR 4/3) to yellowish brown (10YR 5/6).

Pershing Series

The Pershing series consists of somewhat poorly drained or moderately well drained, slowly permeable soils on convex side slopes and convex ridgetops in the loess-covered uplands and on high stream benches. These soils formed in leached loess under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 2 to 9 percent.

Pershing soils are similar to Grundy and Weller soils and are commonly adjacent to Armstrong, Belinda, Gara, Grundy, Rinda, and Weller soils. Grundy soils have a mollic epipedon and do not have an E horizon. Weller soils have a thinner or lighter colored A horizon than the Pershing soils. Armstrong, Gara, and Rinda soils have more sand and less silt. Gara soils have less clay in the Bt horizon. Belinda and Rinda soils are lower in chroma in the Bt horizon. Belinda and Grundy soils are upslope from Pershing soils, and Armstrong, Gara, Rinda, and Weller soils are downslope.

Typical pedon of Pershing silt loam, 2 to 5 percent slopes, 1,060 feet north and 2,040 feet west of the southeast corner of sec. 20, T. 70 N., R. 5 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate fine and

medium granular structure; friable; neutral; clear smooth boundary.

E—7 to 12 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure; friable; common discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; gradual smooth boundary.

BE—12 to 16 inches; yellowish brown (10YR 5/4) and dark grayish brown (10YR 4/2) silty clay loam; common fine faint yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; friable; common grayish brown (10YR 5/2) coatings on faces of peds; few fine segregations (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg1—16 to 22 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—22 to 33 inches; grayish brown (2.5Y 5/2) silty clay; common fine faint and distinct dark grayish brown (10YR 4/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; thin nearly continuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—33 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam (38 percent clay); common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin nearly continuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg4—42 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common thin patchy dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—53 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct light olive brown (2.5Y 5/4), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 48 to 72 inches or more in thickness.

The Ap or A horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1). Texture of the Ap horizon is silt loam or silty clay loam. The Ap or A horizon is 7 to 9 inches thick and ranges from strongly acid to slightly acid in unlimed areas. The E horizon ranges from dark grayish brown (10YR 4/2) to grayish brown (2.5Y 5/2). It ranges from very strongly acid to slightly acid. Clay content of the upper part of the Bt horizon ranges from 42 to 48 percent. The Bt horizon ranges from strongly acid to medium acid.

Richwood Series

The Richwood series consists of well drained, moderately permeable soils on low stream terraces. These soils formed in silty and loamy alluvium under a native vegetation of prairie grasses. Slopes range from 0 to 5 percent.

Richwood soils are commonly adjacent to Nevin soils. Nevin soils have more clay and are lower in chroma in the B horizon than Richwood soils. Nevin soils typically are at the slightly lower elevations.

Typical pedon of Richwood silt loam, 0 to 2 percent slopes, 600 feet north and 2,050 feet east of the southwest corner of sec. 30, T. 73 N., R. 7 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine and fine granular structure; friable; common very dark gray (10YR 3/1) coatings on faces of peds; neutral; clear smooth boundary.

A—7 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure parting to moderate fine granular; friable; continuous very dark gray (10YR 3/1) coatings on faces of peds; medium acid; gradual smooth boundary.

AB—12 to 16 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; common fine faint dark brown (10YR 3/3) mottles; moderate fine subangular blocky structure parting to moderate fine granular; friable; continuous very dark gray (10YR 3/1) coatings on faces of peds; medium acid; gradual smooth boundary.

Bt1—16 to 21 inches; dark brown (10YR 3/3) silt loam (25 percent clay); moderate fine subangular blocky structure; friable; common discontinuous very dark gray (10YR 3/1) coatings on faces of peds; common very thin discontinuous very dark grayish

brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt2—21 to 32 inches; brown (10YR 4/3) silt loam (26 percent clay); moderate fine and medium subangular blocky structure; friable; common discontinuous dark brown (10YR 3/3), very dark grayish brown (10YR 3/2), and very dark gray (10YR 3/1) coatings on faces of peds; common very thin discontinuous very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt3—32 to 44 inches; brown (10YR 4/3) silt loam (25 percent clay); moderate fine and medium subangular blocky structure; friable; common very thin discontinuous very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) clay films on faces of peds; medium acid; gradual smooth boundary.

2Bt4—44 to 54 inches; brown (10YR 4/3) loam; weak medium subangular blocky structure; friable; few very thin patchy dark yellowish brown (10YR 4/4), dark brown (10YR 3/3), and brown (10YR 4/3) clay films on faces of peds; medium acid; gradual smooth boundary.

2BC—54 to 60 inches; brown (10YR 4/3) sandy loam; common fine faint dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; medium acid.

The solum ranges from 40 to 65 inches in thickness.

The A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is 10 to 20 inches thick and ranges from medium acid to neutral. The Bt horizon is silt loam or silty clay loam. Clay content of the Bt horizon ranges from 24 to 34 percent. The Bt horizon ranges from medium acid to neutral. The lower part of the Bt horizon is brown (10YR 4/3) or dark yellowish brown (10YR 4/4).

Rinda Series

The Rinda series consists of poorly drained or somewhat poorly drained, very slowly permeable soils on short, convex side slopes and nose slopes and in coves at the upper end of drainageways in the uplands. These soils formed in a paleosol that formed in glacial till under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 5 to 14 percent.

Rinda soils are similar to Ashgrove and Clarinda soils and are commonly adjacent to Armstrong, Gara, Hedrick, Ladoga, and Pershing soils. Ashgrove soils have a thinner or lighter colored A horizon than Rinda soils. Clarinda soils have a mollic epipedon. Armstrong and Gara soils contain less clay and are higher in chroma in the 2Bt horizon. Hedrick, Ladoga, and Pershing soils contain more silt and less clay and sand and are higher in chroma in the Bt horizon. Armstrong and Gara soils are downslope from Rinda soils, and Ladoga and Pershing soils are upslope.

Typical pedon of Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded, 800 feet south and 2,480 feet west of the northeast corner of sec. 17, T. 73 N., R. 5 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; some streaks and pockets of dark grayish brown (2.5Y 4/2) silty clay subsoil material; moderate fine and medium granular structure; friable; medium acid; clear smooth boundary.

Btg1—8 to 12 inches; dark grayish brown (2.5Y 4/2) silty clay; few fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; very firm; few discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Btg2—12 to 21 inches; dark grayish brown (2.5Y 4/2) clay; common fine faint yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; very firm; few discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Btg3—21 to 32 inches; gray (5Y 5/1) clay; common fine distinct yellowish brown (10YR 5/6), strong brown (7.5YR 5/6), and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; very firm; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Btg4—32 to 50 inches; gray (5Y 6/1) clay; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; very firm; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

2Cg—50 to 60 inches; gray (5Y 6/1) clay; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; massive; very firm; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 42 to 84 inches in thickness.

The A or Ap horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 7 to 9 inches thick and is medium acid or slightly acid in unlimed areas. The Bt horizon ranges from dark grayish brown (10YR 4/2) and gray (5Y 5/1) to light olive gray (5Y 6/2). It ranges from very strongly acid to slightly acid.

Rushville Series

The Rushville series consists of poorly drained, slowly permeable soils on high, loess-covered stream benches. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 0 to 2 percent.

Rushville soils are commonly adjacent to Clinton and Keomah soils on the high stream benches. Keomah and Clinton soils are higher in chroma in the Bt horizon and are downslope from Rushville soils.

Typical pedon of Rushville silt loam, benches, 0 to 2 percent slopes, 1,230 feet north and 810 feet west of the southeast corner of sec. 6, T. 73 N., R. 5 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; few fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate fine granular structure; friable; few light gray (10YR 7/1) dry silt coatings on faces of peds; medium acid; abrupt smooth boundary.

E—7 to 11 inches; gray (10YR 6/1) silt loam, white (10YR 8/1) dry; few fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate thin and medium platy structure; friable; strongly acid; clear smooth boundary.

Eg—11 to 16 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/1) dry; common fine distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate medium platy structure; friable; very strongly acid; clear smooth boundary.

Btg1—16 to 28 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4, 5/6, & 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; common thin nearly continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few gray (10YR 6/1) silt coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg2—28 to 41 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm; thin nearly continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few gray (10YR 6/1) silt coatings on faces of peds; few fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—41 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark grayish brown (2.5Y 4/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Cg—53 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 40 to over 60 inches in thickness.

The A horizon, if present, ranges from very dark gray (10YR 3/1) to very dark grayish brown (10YR 3/2). The A horizon is 0 to 5 inches thick and ranges from very strongly acid to medium acid. The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It ranges from very strongly acid to medium acid in unlimed areas. Some pedons do not have an Ap horizon. The E horizon ranges from gray (10YR 5/1) to light brownish gray (10YR 6/2). It ranges from very strongly acid to medium acid. The Btg horizon ranges from gray (10YR 5/1) to light brownish gray (2.5Y 6/2). It ranges from very strongly acid to medium acid.

Sparta Series

The Sparta series consists of excessively drained, rapidly permeable soils on stream terraces. These soils formed in sandy alluvium, which is wind-reworked in many places, under a native vegetation of prairie grasses. Slopes range from 2 to 5 percent.

Sparta soils are commonly adjacent to Dickinson and Hoopeston soils. Dickinson and Hoopeston soils have more clay in the solum than Sparta soils. In addition, Hoopeston soils are lower in chroma in the B horizon. Dickinson and Hoopeston soils are at slightly lower elevations.

Typical pedon of Sparta loamy fine sand, 2 to 5 percent slopes, 270 feet north and 2,190 feet west of the southeast corner of sec. 30, T. 73 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; clear smooth boundary.

AB—8 to 13 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; medium acid; gradual smooth boundary.

Bw1—13 to 28 inches; brown (7.5YR 4/4) loamy fine sand; weak medium and coarse subangular blocky structure; very friable; medium acid; gradual smooth boundary.

Bw2—28 to 39 inches; brown (7.5YR 4/4) loamy fine sand; weak medium and coarse subangular blocky structure; very friable; medium acid; gradual smooth boundary.

C—39 to 60 inches; yellowish brown (10YR 5/4) fine sand; single grained; loose; medium acid.

The solum ranges from 24 to 40 inches in thickness. The mollic epipedon is 10 to 24 inches thick.

The Ap or A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). It is loamy fine sand or loamy sand. The Ap or A horizon and the AB horizon are 10 to 24 inches thick and are medium acid in reaction in unlimed areas. The Bw horizon ranges from dark brown (10YR 3/3) to strong brown (7.5YR 5/6). It is sand, fine sand, loamy sand, or loamy fine sand. The C horizon ranges from brown (10YR 4/3) to strong brown (7.5YR 5/6) and is fine sand or sand.

Sperry Series

The Sperry series consists of very poorly drained or poorly drained, slowly permeable soils in slight depressions on level, loess-covered upland divides and stream benches. These soils formed in leached loess under a native vegetation of sedges and prairie grasses. Slopes range from 0 to 1 percent.

Sperry soils are commonly adjacent to Kalona and Taintor soils. Kalona and Taintor soils do not have an E horizon. These soils typically are at slightly higher elevations than Sperry soils.

Typical pedon of Sperry silt loam, 0 to 1 percent slopes, 1,650 feet south and 160 feet west of the northeast corner of sec. 1, T. 72 N. R. 5 W.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; neutral; abrupt smooth boundary.

E1—11 to 15 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; weak medium platy structure parting to moderate very fine subangular blocky; friable; many light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

E2—15 to 18 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; weak fine and medium subangular blocky structure; friable; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Btg1—18 to 24 inches; dark gray (10YR 4/1) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate very fine and fine subangular blocky; very firm; few very dark gray (10YR 3/1) coatings on faces of peds; thin continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—24 to 29 inches; dark gray (10YR 4/1) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; very firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg3—29 to 35 inches; gray (10YR 5/1) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; very firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg4—35 to 41 inches; gray (5Y 5/1) silty clay; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; very firm; few thin patchy dark gray (10YR 4/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg5—41 to 46 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; firm; common thin discontinuous gray (10YR 5/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BCg—46 to 53 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Cg—53 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral.

The solum ranges from 40 to 68 inches in thickness. The mollic epipedon is 10 to 12 inches thick.

The Ap and A horizons are black (10YR 2/1) or very dark gray (10YR 3/1). They are 10 to 12 inches thick and medium acid or slightly acid in unlimed areas. The E horizon ranges from strongly acid to slightly acid. The Btg horizon ranges from dark gray (10YR 4/1) to gray (5Y 5/1). It ranges from strongly acid to slightly acid.

Taintor Series

The Taintor series consists of poorly drained, moderately slowly permeable soils on broad flats on the

loess-covered upland divides and on high, loess-covered stream benches. These soils formed in leached loess under a native vegetation of tall prairie grasses. Slopes range from 0 to 2 percent.

Taintor soils are commonly adjacent to Kalona, Mahaska, and Sperry soils. Kalona soils have more clay in the Ap horizon than Taintor soils and do not have an argillic horizon. Mahaska soils are higher in chroma in the B horizon. Sperry soils have an E horizon. Kalona soils are in the center of the large flats, and Taintor soils are on the outer edges. Mahaska soils are downslope from Taintor soils, and Sperry soils are in slight depressions.

Typical pedon of Taintor silty clay loam, 0 to 2 percent slopes, 180 feet south and 1,300 feet east of the northwest corner of sec. 10, T. 72 N., R. 5 W.

Ap—0 to 10 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

A—10 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure parting to moderate fine and medium granular; friable; many black (N 2/0) coatings on faces of peds; neutral; gradual smooth boundary.

AB—15 to 19 inches; very dark gray (10YR 3/1) silty clay (41 percent clay), gray (10YR 5/1) dry; common fine faint dark gray (5Y 4/1) mottles; moderate very fine subangular blocky structure parting to moderate fine and medium granular; firm; many black (10YR 2/1) coatings on faces of peds; slightly acid; gradual smooth boundary.

Btg1—19 to 23 inches; dark gray (5Y 4/1) silty clay (44 percent clay); common fine distinct yellowish brown (10YR 5/6), dark yellowish brown (10YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; common thin discontinuous dark gray (5Y 4/1) and very dark gray (5Y 3/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg2—23 to 28 inches; gray (5Y 5/1) silty clay (43 percent clay); common fine faint dark gray (5Y 4/1) and common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous dark gray (5Y 4/1), gray (5Y 5/1), and very dark gray (5Y 3/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg3—28 to 33 inches; gray (5Y 5/1) silty clay (41 percent clay); common fine faint and distinct olive gray (5Y 5/2), gray (5Y 6/1), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark gray (5Y 4/1), gray (5Y 5/1), and very dark gray (5Y 3/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Btg4—33 to 39 inches; gray(5Y 5/1) silty clay loam (37 percent clay); common fine faint and distinct olive gray (5Y 5/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common thin discontinuous dark gray (5Y 4/1), gray (5Y 5/1), and very dark gray (5Y 3/1) clay films on faces of peds; common fine and medium segregations and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

BCg—39 to 49 inches; gray (5Y 6/1) silty clay loam; common fine faint olive gray (5Y 5/2) and common fine and medium distinct light olive brown (2.5Y 5/4), brown (7.5YR 4/4), and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; friable; common fine and medium segregations and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

Cg—49 to 60 inches; gray (5Y 6/1) silt loam; common fine faint olive gray (5Y 5/2) and common fine and medium distinct yellowish brown (10YR 5/6), yellowish red (5YR 4/6), and strong brown (7.5YR 5/6) mottles; massive; friable; common fine and medium segregations and concretions (iron and manganese oxides); mildly alkaline.

The solum ranges from 42 to 72 inches in thickness. The thickness of the mollic epipedon is 16 to 24 inches.

The Ap and A horizons are 10 to 16 inches thick and are slightly acid in unlimed areas. The AB horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2) and is medium acid or slightly acid. Clay content of the Bt horizon ranges from 35 to 44 percent, and the upper 20 inches of the Btg horizon averages between 38 and 42 percent clay. The Btg horizon is medium acid or slightly acid.

Tuskeego Series

The Tuskeego series consists of poorly drained, very slowly permeable soils on low stream terraces. These soils formed in silty and clayey alluvial sediments under a native vegetation of mixed prairie grasses and deciduous trees. Slopes range from 0 to 2 percent.

Tuskeego soils are similar to Okaw soils and are commonly adjacent to Colo, Coppock, Nodaway, and Vesser soils. Okaw soils have a thinner or a lighter colored A horizon than Tuskeego soils. Colo and Vesser

soils have a mollic epipedon. Colo and Nodaway soils do not have an argillic horizon and have less clay in the control section. Coppock and Vesser soils have less clay in the Bt horizon. Colo, Coppock, Nodaway, and Vesser soils typically are at slightly lower elevations.

Typical pedon of Tuskeego silt loam, 0 to 2 percent slopes, 1,910 feet north and 330 feet east of the southwest corner of sec. 8. T. 71 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; neutral; clear smooth boundary.

E1—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common fine faint grayish brown (10YR 5/2) mottles; moderate medium platy structure; friable; common very dark grayish brown (10YR 3/2) coatings on faces of peds; slightly acid; clear smooth boundary.

E2—12 to 17 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint and distinct dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), and yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; common light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Btg1—17 to 23 inches; dark gray (10YR 4/1) and grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6 & 5/4) mottles; moderate fine subangular blocky structure; friable; few thin patchy dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) clay films on faces of peds; many light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Btg2—23 to 32 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4), dark grayish brown (10YR 4/2), and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Btg3—32 to 42 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4), dark grayish brown (10YR 4/2), and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; common thin discontinuous dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg4—42 to 51 inches; grayish brown (2.5Y 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; common thin discontinuous dark grayish brown (2.5Y 4/2) and grayish brown (2.5Y 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—51 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common fine segregations and concretions (iron and manganese oxides); slightly acid.

The solum ranges from 48 to 72 inches in thickness.

The Ap or A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). It is 7 to 9 inches thick and ranges from strongly acid to neutral. The E horizon ranges from dark gray (10YR 4/1) to grayish brown (10YR 5/2) and ranges from slightly acid to strongly acid. The Btg horizon ranges from dark gray (10YR 4/1) to grayish brown (2.5Y 5/2). It is silty clay or silty clay loam and ranges from strongly acid to slightly acid.

Vesser Series

The Vesser series consists of somewhat poorly drained or poorly drained, moderately permeable soils on the higher part of bottom lands, foot slopes, and alluvial fans. These soils formed in silty alluvium under a native vegetation of prairie grasses that tolerate wetness. Slopes range from 0 to 5 percent.

Vesser soils are similar to Coppock soils and are commonly adjacent to Colo, Coppock, Nodaway, and Tuskeego soils. Colo soils do not have a B horizon and have a thicker mollic epipedon than Vesser soils. Coppock, Nodaway, and Tuskeego soils do not have a mollic epipedon. Nodaway soils have less clay in the control section and do not have a B horizon. Tuskeego soils have more clay in the Bt horizon. Colo, Nodaway, and Tuskeego soils are at slightly lower elevations, and Coppock soils are at the same elevation as Vesser soils.

Typical pedon of Vesser silt loam, 0 to 2 percent slopes, 84 feet north and 2,590 feet east of the southwest corner of sec. 10, T. 73 N., R. 5 W.

A1—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine and medium granular structure; friable; neutral; gradual smooth boundary.

A2—9 to 14 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to moderate fine granular; friable; neutral; gradual smooth boundary.

A3—14 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; common very dark gray (10YR 3/1) coatings on faces of peds; neutral; clear smooth boundary.

E1—17 to 23 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; common very dark grayish brown (10YR 3/2) and very dark gray (10YR 3/1) coatings on faces of peds; medium acid; gradual smooth boundary.

E2—23 to 28 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; common fine faint grayish brown (10YR 5/2) mottles; weak medium platy structure; friable; strongly acid; gradual smooth boundary.

E3—28 to 32 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine faint dark grayish brown (10YR 4/2) mottles; weak medium platy structure; friable; strongly acid; gradual smooth boundary.

Btg1—32 to 48 inches; very dark grayish brown (10YR 3/2) and dark gray (10YR 4/1) silty clay loam; few fine faint dark grayish brown (10YR 4/2) mottles; moderate fine and medium subangular blocky structure; firm; common thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; common light brownish gray (10YR 6/2) and light gray (10YR 7/2) dry silt coatings on faces of peds; medium acid; gradual smooth boundary.

Btg2—48 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6), brown (7.5YR 4/4), and dark grayish brown (2.5Y 4/2) mottles; moderate medium subangular blocky structure; firm; common thin discontinuous dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 48 to 72 inches in thickness. The mollic epipedon is 12 to 20 inches thick.

The Ap or A horizon ranges from black (10YR 2/1) to very dark grayish brown (10YR 3/2). Texture of the Ap or A horizon is silt loam or silty clay loam. The Ap and A horizons are 12 to 20 inches thick and range from medium acid to neutral. The E horizon ranges from dark gray (10YR 4/1) to grayish brown (10YR 5/2). The Btg horizon ranges from very dark gray (10YR 3/1) to grayish brown (2.5Y 5/2) and ranges from strongly acid to slightly acid.

Weller Series

The Weller series consists of moderately well drained, slowly permeable soils on convex side slopes and ridgetops in the loess-covered uplands and on high, loess-covered stream benches. These soils formed in leached loess under a native vegetation of deciduous trees. Slopes range from 2 to 14 percent.

Weller soils are similar to Pershing soils and are commonly adjacent to Ashgrove, Beckwith, Keswick, Lindley, and Pershing soils. Pershing soils have a thicker or darker A horizon than Weller soils. Ashgrove and Beckwith soils are lower in chroma in the Bt horizon. Keswick and Lindley soils have more sand and less silt. Lindley soils have less clay in the Bt horizon. Beckwith and Pershing soils are upslope from Weller soils, and Ashgrove, Keswick, and Lindley soils are downslope.

Typical pedon of Weller silt loam, 2 to 5 percent slopes, 125 feet north and 1,545 feet east of the southwest corner of sec. 20, T. 71 N., R. 7 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; neutral; abrupt smooth boundary.

E—7 to 12 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure; friable; common dark grayish brown (10YR 4/2) coatings on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; clear smooth boundary.

BE—12 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; moderate very fine and fine subangular blocky structure; friable; common dark grayish brown (10YR 4/2) coatings on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—17 to 21 inches; yellowish brown (10YR 5/4) silty clay; few fine faint yellowish brown (10YR 5/6) mottles; moderate very fine and fine subangular blocky and angular blocky structure; very firm; common thin discontinuous brown (10YR 4/3) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Bt2—21 to 29 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky and angular blocky structure; very firm; thin nearly continuous brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay films on faces of peds; common light gray (10YR 7/2) dry silt coatings on faces of peds; common very fine and fine segregations and concretions (iron and manganese oxides); very strongly acid; gradual smooth boundary.

Bt3—29 to 36 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; thin nearly continuous brown (10YR 4/3) and dark grayish brown (10YR 4/2) clay films on faces of peds; common fine segregations

and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt4—36 to 48 inches; grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6 & 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); strongly acid; gradual smooth boundary.

Bt5—48 to 60 inches; light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6 & 5/4) silty clay loam; weak medium subangular blocky structure; friable; few thin discontinuous grayish brown (2.5Y 5/2) clay films on faces of peds; common fine segregations and concretions (iron and manganese oxides); medium acid.

The solum ranges from 48 to 72 inches or more in thickness.

The A horizon, where present, ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). It is 5 inches or less in thickness and strongly acid or medium acid in unlimed areas. The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). It is silt loam or silty clay loam and strongly acid or medium acid in unlimed areas. Some pedons do not have an Ap horizon. The E horizon is grayish brown (10YR 5/2) or brown (10YR 5/3), but if mixed with the B horizon it includes yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4). The E horizon ranges from very strongly acid to medium acid. Some pedons do not have an E horizon. The Bt horizon ranges from yellowish brown (10YR 5/4) or dark yellowish brown (10YR 4/4) to grayish brown (2.5Y 5/2). It is silty clay or silty clay loam and ranges from very strongly acid to medium acid.

Formation of the Soils

This section discusses the factors of soil formation and relates these factors to the soils in Henry County.

Factors of Soil Formation

Soil is produced by the action of soil-forming processes on materials deposited or accumulated by geological agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the climate under which the soil material has accumulated and existed since accumulation; (3) the plant and animal life on and in the soil; (4) the relief, or lay of the land; and (5) the length of time the processes of soil development have acted on the soil material (*8*).

Climate and vegetation are the active factors in the formation of soil. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body with genetically related horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. It may be much or little, but some time is always required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent Material and Geology

Most of the soils in Henry County formed in loess, or windblown material; glacial till, or material deposited by glaciers or glacial ice; and alluvium, or water-laid material. A few small areas of eolian or windblown sands occur along the Skunk River, and in some other places limestone is the parent material. In this county, parent material is important in developing the general character of the soil profile.

Loess—Wisconsin-age loess covers most of Henry County and is an extensive parent material (*18, 19*). It consists of accumulated particles of silt and clay that have been deposited by wind. Variations in soils are related to the distance of the soils from the source of loess. The dominant source of loess in Henry County is not known, but it probably is the Iowa and Mississippi Rivers, with some coming from the Missouri River in western Iowa (*4*).

On the stable upland divides, the loess is about 8 to 10 feet thick. It is slightly thicker in the northern part of the county, where Mahaska, Otley, and Taintor soils are the dominant loessial soils, than it is in the southern part, where the Grundy and Haig soils are the dominant loessial soils. In this county, Arispe, Beckwith, Belinda, Clinton, Edina, Fayette, Givin, Hedrick, Kalona, Keomah, Ladoga, Nira, Pershing, Rushville, Sperry, and Weller soils also were derived from loess. Many of the high benches (*21*) along the major streams and rivers are covered with loess. The loess on these benches contains slightly less clay and slightly more sand than the loess covering the uplands. The soil material underlying the loess in these areas is stratified pre-Sangamon or Late-Sangamon sediments that are generally high in sand content.

Glacial till—In Henry County the major Pleistocene deposits of pre-Wisconsin age are Nebraskan and Kansan drift (*20*) with some Illinoian drift (*6*) in the southeast part. The Kansan drift is identifiable throughout the county, and on side slopes it forms an extensive part of the landscape. The Illinoian drift is identifiable in the southeast part of the county. The Nebraskan drift, however, is not readily identifiable at the surface in the county. But in some of the deep road cuts and along some of the major stream valleys, a buried soil, or paleosol, is present below the Kansan drift. This buried soil, or paleosol, below the Kansan glacial till formed in the Nebraskan drift, and it is called the Aftonian gumbotil (*9, 10*).

Glacial till is considered the dominant lithologic unit of all glacial drifts. Glacial till is composed of coarse fragments in a clay loam matrix. The upper part of a glacial till consists of yellowish brown material that is oxidized and leached; the lower part consists of dark gray material that is calcareous, contains limestone and dolomite particles, and is unoxidized and unleached.

Therefore, the major portion of the Nebraskan drift is the Nebraskan glacial till, the major portion of the Kansan drift is the Kansan glacial till, and the major portion of the Illinoian drift is the Illinoian glacial till. After the Nebraskan glaciers, but before the Kansan glaciers, there was the warmer Aftonian interglacial period. Between the Kansan glaciers and the Illinoian glaciers,

there was the warmer Yarmouth interglacial period. And after the Illinoian glaciers, but before the Wisconsin glaciers that were in north-central Iowa, there was the warmer Sangamon period. The soils that formed on the landscape during the warmer Aftonian, Yarmouth, and Sangamon periods are called ancient soils, or paleosols. Thus soils that formed in Nebraskan till before being buried by the Kansan drift are called Aftonian paleosols, soils that formed on the Kansan till before being buried by the Illinoian drift are called Yarmouth paleosols, and soils that formed on the Illinoian till are called Sangamon paleosols. Soils that formed on the Kansan till and were not covered by the Illinoian drift are called Yarmouth-Sangamon paleosols. The Yarmouth-Sangamon soils formed on the landscape both during the warmer Yarmouth interglacial period and the warmer Sangamon interglacial period.

In Henry County, soils formed on the Kansan till plain during the Yarmouth and Sangamon interglacial ages, before the loess was deposited, and on the Illinoian till plain during the Sangamon interglacial age, before the loess was deposited. On nearly level interstream divides, these ancient soils, or paleosols, were strongly weathered and developed a thick, gray, plastic, clayey subsoil. This paleosol is several feet thick and is very slowly permeable. The Ashgrove, Clarinda, and Rinda soils formed in this paleosol and are extensive throughout the county.

Also before loess was deposited, geologic erosion cut below the Yarmouth-Sangamon paleosol into the Kansan till and older deposits or below the Sangamon paleosol into the Illinoian till and older deposits. Generally, at the depth to which this geologic erosion cut into the landscape, there is a stone line or subjacent glacial till that is overlain by pedisediment, loamy sediments (*14, 17*). During the latter part of the warmer Sangamon interglacial period an ancient soil, or paleosol, formed in the pedisediment, in the stone line, and in the subjacent glacial till. This paleosol is called the Late-Sangamon Paleosol (*14, 15*). It is generally reddish in color and is typically thinner than the Yarmouth-Sangamon Paleosol. The Adair, Armstrong, and Keswick soils formed in the Late-Sangamon Paleosol.

The glacial till and paleosols were covered by windblown loess during the Wisconsin glacial period. Geologic erosion, however, removed the loess from many slopes and exposed these strongly eroded weathered paleosols. In some places the paleosols have been beveled or truncated, and only the lower part of the strongly weathered materials remains. In other places, erosion removed all the paleosols and exposed till that is only slightly weathered. The Gara and Lindley soils formed in the recently eroded glacial till that is only slightly weathered.

Douds and Galland soils formed in pre-Sangamon or Late-Sangamon waterlaid sediments that have variable texture. Douds and Galland soils occur on low, stepped interfluves above the present drainage system. But the surface they form merges with the present erosional uplands. Douds and Galland soils are on distinctly higher landscape positions than the soils on the flood plain. These pre-Sangamon or Late-Sangamon erosional sediments appear to have been angularly truncated in many places. As a result, they generally consist of an irregular mixture of materials of contrasting textures.

Alluvium—Sediment that has been eroded from hillslopes and laid down by running water, such as streams, is called alluvium. These sediments are sorted to some extent as they move. Because the alluvium in Henry County is derived from loess and glacial drift, it is largely a mixture of silt and clay, of silt and sand, or of sand and gravel. The coarse sand and gravel generally are only in the pre-Sangamon alluvial sediments on the stream benches. Sediments accumulated at the foot of the slope on which they originated are called colluvium, or local alluvium.

Alluvial sediments are the parent materials of the soils on flood plains, on terraces, and along drainageways. As the river overflows its channel and the water spreads over the flood plain, coarse-textured sediments are deposited. After the flood has passed, the finest particles, or clay, settle from the water that is left standing on the lowest part of the flood plain.

Klum, Nodaway, and Perks soils commonly are closest to the stream channel and are coarser in texture than the other soils on the bottom land. Ainsworth, Okaw, Nevin, and Richwood soils are fairly extensive along the Skunk River. Colo, Coppock, and Tuskeego soils are along the smaller streams in the county. Colo and Nodaway soils are widely distributed throughout the county. Cantril soils are the dominant soils that formed in colluvium, and they commonly contain more sand than the soils that formed in alluvium.

In some areas, streams are cutting through limestone, and flood plains are narrower and have a steeper gradient. The Nodaway-Cantril complex and the Nodaway soils are commonly on these flood plains.

Limestone—The oldest parent material in the county is a series of limestone beds deposited during the Mississippian and Pennsylvanian periods. The beds range from a few inches to several feet in thickness. Nordness soils formed in limestone. The thicker beds are good sources of road aggregate and agricultural lime.

Several layers of limestone are commonly exposed on the slopes along the major streams and their tributaries. In most places, this exposed rock is many feet thick, and rock fragments on the side slope below the outcrop.

Climate

The soils in Henry County have been developing under a midcontinental, subhumid climate for the past 3,000 years (*14*). The morphology and properties of most of the soils indicate that the climate in which these soils

developed was similar to the present climate. From about 30,000 years to about 11,000 years ago, the climate was more cool and moist, and coniferous forest vegetation dominated the landscape. As the climate warmed, deciduous forest invaded and persisted until about 9,000 years ago (*18*). Further climatic warming and greater dryness, similar to the present, have dominated since, and Henry County, depending upon the landscape, has been dominated by prairie, mixed prairie and deciduous forest, and deciduous forest vegetations under this climatic regime. Lane's pollen study (*11*) indicated that the climate during the Sangamon period of the Pleistocene epoch was cool and moist and conducive mostly to growth of conifers.

The influence of the general climate in a region is modified by local conditions in or near the developing soils. For example, soils on southfacing slopes formed under a microclimate that was warmer and drier than the average climate of nearby areas. The low-lying, poorly drained soils on bottom lands formed in a wetter and colder climate than those soils in most areas around them. These local differences influence the characteristics of the soil and account for some of the differences among soils in the same general climatic region.

Vegetation

Many changes in climate and vegetation took place in Iowa during the postglacial period. Spruce-dominated forest grew on the soils until about 11,000 years ago and was followed by deciduous forest that lasted until about 9,000 years ago. Then prairie began to dominate in the state.

For the past 10,000 years, the soils of the county appear to have been influenced by two main kinds of vegetation, prairie grasses and deciduous trees. Big bluestem and little bluestem were the main prairie grasses. The trees were mainly oak, hickory, ash, elm, and maple.

The effects of vegetation on soils similar to those in Henry County have been studied recently. Evidence shows that vegetation shifted while soils formed in areas bordering trees and grasses. The morphology of Armstrong, Belinda, Gara, Givin, Hedrick, Ladoga, Pershing, and Rinda soils reflects the influence of both trees and grasses. The Ashgrove, Beckwith, Clinton, Douds, Fayette, Galland, Keomah, Keswick, Lindley, Rushville, and Weller soils formed under the influence of trees (*13*). Grasses influenced the formation of Adair, Arispe, Clarinda, Colo, Edina, Grundy, Haig, Kalona, Mahaska, Nira, Otley, Sperry, and Taintor soils.

Soils that formed under trees are lighter colored, more acid, and have a thinner surface layer than soils that formed under grasses. The few soils in the county that formed under shifting vegetation or mixed grasses and trees have properties that are intermediate between the properties of soils that formed under grasses and those that formed under trees.

Relief

Relief is an important cause of differences among soils. It indirectly influences soil formation through its effect on drainage. In Henry County soils range from level to very steep. Many nearly level areas of the bottom lands are frequently flooded and have a permanently or periodically high water table. In nearly level and depressional areas of the uplands, water soaks in, whereas on the stronger slopes, rainfall runs off.

Level soils are on the broad upland flats and on the stream bottoms. The steepest soils in the county are generally on the southern and western sides of the major streams and their tributaries. The intricate pattern of upland drainageways indicates that in nearly all of the county the landscape has been modified by geological processes.

Generally, the soils in the county that formed where the water table is high have a subsoil that is dominantly grayish. Examples are Beckwith, Belinda, Edina, Haig, Kalona, and Taintor soils. Adair, Givin, Grundy, Keomah, Mahaska, Pershing, and similar soils formed where the water table fluctuated and was periodically high. Gara, Lindley, and other soils formed where the water table was below the subsoil, and their subsoil is yellowish brown. Colo, Haig, Kalona, and Taintor soils that developed under prairie grasses and that have a high water table contain more organic matter in the surface layer than well drained soils that formed under prairie grasses. Clay accumulates in the subsoil of soils such as Edina soils, which are slightly depressional or nearly level, because a large amount of water enters the soils and carries clay particles downward. Edina soils are commonly called claypan soils because of their very slowly permeable subsoil where the greatest amount of clay accumulates.

A study of Pershing and Weller soils was made to determine the effect of the relief on the soils. Tests showed that from the stable to the unstable slopes there was an increase in content of clay in the A horizon and a decrease in thickness of the A1 horizon. In the unstable landscape, the zone of maximum clay accumulation was at a shallow depth. This indicates that more soil development has taken place on the most stable kind of landscape.

In Gara, Lindley, and similar soils that have a wide slope range and many kinds of slopes, depth to carbonate is shallowest where slopes are steepest, are convex, or are most unstable.

Time

The length of soil development affects the kind of soil that forms. An older or more strongly developed soil shows well defined genetic horizons. A less well

developed soil shows no horizons or only weakly defined horizons. Most soils on the flood plain are weakly developed because they have not been in place long enough for distinct horizons to develop.

On steep slopes, the soil material is generally removed before there has been time to develop a thick profile that has strong horizons. Even though the material has been in place for a long time, the soil may still be immature because much of the water runs off the slopes rather than through the soil material. Ruhe (*15*) stated that Gara and Lindley soils formed on slopes dissected in the late Wisconsin age. These soils, therefore, are no older than 11,000 to 14,000 years and probably are much younger.

According to Ruhe and Scholtes (*19*), Adair, Armstrong, Keswick, Clarinda, and Galland soils are among the oldest soils in the county. Clarinda soils formed in Kansan glacial till during the Yarmouth-Sangamon period. Adair, Armstrong, Keswick, and Galland soils formed from materials deposited during the Late-Sangamon interglacial stage. These materials are much older than the loessial parent material of Arispe, Beckwith, Belinda, Clinton, Edina, Fayette, Givin, Grundy, Haig, Hedrick, Kalona, Keomah, Ladoga, Mahaska, Nira, Otley, Pershing, Rushville, Sperry, Taintor, and Weller soils. These soils are no older than 14,000 to 16,000 years, and they may be considerably younger.

Radiocarbon studies of wood fragments and soil organic matter found in loess and glacial till have made it possible to determine the approximate ages of soils and of the loessial and glacial deposits in Iowa. In Henry County, the loess is thickest in the nearly level soils on stable upland divides, and it is underlain by a Yarmouth-Sangamon paleosol that is on the Kansan till surface. In many places below the stable uplands, there is an organic layer at the base of the loess. Ruhe, Hallberg, and others recently studied the loess and organic matter of the basal loess in Lee and Des Moines Counties, Iowa, and obtained radiocarbon ages of 18,000 to 25,000 years (*6, 16*).

Man's Influence on the Soil

Important changes take place in the soil when it is cultivated. Some of these changes have little effect on productivity; others have a drastic effect.

Changes caused by water erosion generally are the most apparent. On many of the cultivated soils in the county, particularly the gently rolling to hilly soils, part or all of the original surface layer has been lost through sheet erosion. In some places shallow to deep gullies have formed.

In many continuously cultivated fields, the granular structure that was apparent when the grassland was undisturbed is no longer present. In these fields, the surface tends to bake and harden when it dries. Fine-textured soils that have been plowed when too wet tend to puddle and are less permeable than similar soils in undisturbed areas.

Man has done much to increase the productivity of the soils and to reclaim areas not suitable for crops. He has made large areas of bottom land suitable for cultivation by digging drainage ditches and constructing diversions at the foot of slopes. Areas of Haig and Taintor soils on broad flats have been greatly improved for cultivation by installing a drainage system.

By adding commercial fertilizers, man has counteracted deficiencies in plant nutrients and has made some soils more productive than they were in their natural state.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Benches (geologic). Higher, older terrace (old alluvial plain) that is now a part of the erosion surface of the valley (*21*). Typically, in Iowa, the benches are of Pre-Wisconsin age and are covered with loess.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing

season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated

by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Gumbotil. Leached, deoxidized clay containing siliceous stones; the product of thorough chemical decomposition of clay-rich glacial till.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Paleosol. A buried soil or formerly buried soil, especially one that formed during an interglacial period and was covered by deposits of later glaciers.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. Water-sorted sediments at the top of a paleosol.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction

because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25

Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded and 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. Includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These

changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-79 at Mount Pleasant, Iowa]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	30.0	11.6	20.8	59	-19	0	1.45	0.54	2.21	4	8.6
February---	36.2	17.4	26.8	63	-15	7	1.06	.43	1.58	3	4.9
March------	47.4	27.2	37.3	79	-1	35	2.62	1.08	3.91	6	4.3
April------	63.4	40.4	51.9	86	20	135	3.73	1.92	5.31	7	.3
May--------	73.9	50.7	62.3	91	31	391	3.57	1.94	5.01	7	.0
June-------	83.0	59.9	71.5	95	43	645	4.03	2.47	5.42	6	.0
July-------	86.8	63.8	75.3	99	48	784	4.09	2.06	5.86	6	.0
August-----	84.8	61.4	73.1	99	46	716	4.16	1.93	6.08	6	.0
September--	77.6	53.3	65.5	94	33	465	3.89	1.14	6.11	6	.0
October----	67.1	43.0	55.1	89	22	218	2.84	.87	4.43	5	.1
November---	49.8	30.3	40.1	74	5	15	1.77	.67	2.68	4	1.6
December---	36.1	19.1	27.6	63	-13	0	1.59	.70	2.34	4	6.6
Year-----	61.3	39.8	50.6	100	-20	3,411	34.80	27.97	41.31	64	26.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the areas (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-79 at Mount Pleasant, Iowa]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 15	April 25	May 7
2 years in 10 later than--	April 11	April 21	May 3
5 years in 10 later than--	April 3	April 13	April 26
First freezing temperature in fall:			
1 year in 10 earlier than--	October 18	October 11	September 25
2 years in 10 earlier than--	October 23	October 16	September 30
5 years in 10 earlier than--	November 2	October 26	October 10

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-79 at Mount Pleasant, Iowa]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	192	174	146
8 years in 10	199	182	153
5 years in 10	212	195	166
2 years in 10	226	209	180
1 year in 10	233	216	187

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
13B	Vesser-Colo complex, 2 to 5 percent slopes	1,550	0.6
23C	Arispe silty clay loam, 5 to 9 percent slopes	650	0.2
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded	980	0.3
41B	Sparta loamy fine sand, 2 to 5 percent slopes	280	0.1
51	Vesser silt loam, 0 to 2 percent slopes	330	0.1
56B	Cantril loam, 2 to 5 percent slopes	400	0.2
58E	Douds loam, 14 to 18 percent slopes	420	0.2
58F	Douds loam, 18 to 40 percent slopes	560	0.2
65E	Lindley loam, 14 to 18 percent slopes	1,070	0.4
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	890	0.3
65F	Lindley loam, 18 to 25 percent slopes	7,630	2.7
65G	Lindley loam, 25 to 40 percent slopes	1,320	0.5
75	Givin silt loam, 0 to 2 percent slopes	2,510	0.9
75B	Givin silt loam, 2 to 5 percent slopes	1,600	0.6
76B	Ladoga silt loam, 2 to 5 percent slopes	5,420	1.9
76C	Ladoga silt loam, 5 to 9 percent slopes	780	0.3
76C2	Ladoga silt loam, 5 to 9 percent slopes, moderately eroded	7,120	2.5
76D2	Ladoga silt loam, 9 to 14 percent slopes, moderately eroded	220	0.1
80B	Clinton silt loam, 2 to 5 percent slopes	2,790	1.0
80C	Clinton silt loam, 5 to 9 percent slopes	2,500	0.9
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded	6,460	2.3
80D	Clinton silt loam, 9 to 14 percent slopes	380	0.1
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded	1,410	0.5
88	Nevin silty clay loam, 0 to 2 percent slopes	470	0.2
110B	Lamont fine sandy loam, 2 to 5 percent slopes	660	0.2
110C	Lamont fine sandy loam, 5 to 9 percent slopes	670	0.2
122	Sperry silt loam, 0 to 1 percent slopes	550	0.2
130	Belinda silt loam, 0 to 2 percent slopes	3,130	1.1
131B	Pershing silt loam, 2 to 5 percent slopes	9,070	3.2
131C	Pershing silt loam, 5 to 9 percent slopes	910	0.3
132B	Weller silt loam, 2 to 5 percent slopes	5,110	1.8
132C	Weller silt loam, 5 to 9 percent slopes	2,690	1.0
133	Colo silty clay loam, 0 to 2 percent slopes	2,050	0.7
133B	Colo silty clay loam, 2 to 5 percent slopes	4,730	1.7
133+	Colo silt loam, overwash, 0 to 2 percent slopes	660	0.2
154E	Ainsworth-Lamont complex, 9 to 18 percent slopes	540	0.2
163B	Fayette silt loam, 2 to 5 percent slopes	370	0.1
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded	310	0.1
173	Hoopeston fine sandy loam, 0 to 2 percent slopes	350	0.1
175	Dickinson fine sandy loam, 0 to 2 percent slopes	280	0.1
179E	Gara loam, 14 to 18 percent slopes	440	0.2
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded	270	0.1
180	Keomah silt loam, 0 to 2 percent slopes	370	0.1
180B	Keomah silt loam, 2 to 5 percent slopes	470	0.2
192D2	Adair loam, 9 to 14 percent slopes, moderately eroded	460	0.2
208	Klum fine sandy loam, 0 to 2 percent slopes	640	0.2
211	Edina silt loam, 0 to 1 percent slopes	160	0.1
220	Nodaway silt loam, 0 to 2 percent slopes	2,830	1.0
222C	Clarinda silty clay loam, 5 to 9 percent slopes	920	0.3
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded	1,370	0.5
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded	3,080	1.1
223D2	Rinda silty clay loam, 9 to 14 percent slopes, moderately eroded	1,660	0.6
260	Beckwith silt loam, 0 to 2 percent slopes	820	0.3
263	Okaw silt loam, 0 to 2 percent slopes	990	0.4
263B	Okaw silt loam, 2 to 5 percent slopes	620	0.2
264B	Ainsworth silt loam, 2 to 5 percent slopes	1,230	0.4
264C2	Ainsworth silt loam, 5 to 9 percent slopes, moderately eroded	600	0.2
279	Taintor silty clay loam, 0 to 2 percent slopes	23,200	8.3
280	Mahaska silty clay loam, 0 to 2 percent slopes	16,750	6.0
280B	Mahaska silty clay loam, 2 to 5 percent slopes	7,860	2.8
281B	Otley silty clay loam, 2 to 5 percent slopes	10,740	3.8
281C	Otley silty clay loam, 5 to 9 percent slopes	3,450	1.2
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded	6,100	2.2
293B	Chelsea-Lamont-Fayette complex, 2 to 5 percent slopes	430	0.2
293C	Chelsea-Lamont-Fayette complex, 5 to 9 percent slopes	980	0.3
293E	Chelsea-Lamont-Fayette complex, 9 to 18 percent slopes	910	0.3
293F	Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes	800	0.3
315	Klum-Perks-Nodaway complex, 1 to 3 percent slopes	2,970	1.1
362	Haig silt loam, 0 to 2 percent slopes	5,740	2.1
363	Haig silty clay loam, 0 to 2 percent slopes	360	0.1
364B	Grundy silt loam, 2 to 5 percent slopes	4,340	1.6
424D	Lindley-Keswick loams, 9 to 14 percent slopes	1,040	0.4

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded	3,510	1.2
424E	Lindley-Keswick loams, 14 to 18 percent slopes	6,460	2.3
424E2	Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded	5,460	1.9
425D	Keswick loam, 9 to 14 percent slopes	420	0.2
425D2	Keswick loam, 9 to 14 percent slopes, moderately eroded	2,450	0.9
452D2	Lineville silt loam, 9 to 14 percent slopes, moderately eroded	250	0.1
453	Tuskeego silt loam, 0 to 2 percent slopes	600	0.2
478G	Nordness-Rock outcrop complex, 25 to 40 percent slopes	1,740	0.6
484	Lawson silt loam, 0 to 2 percent slopes	490	0.2
499D	Nordness silt loam, 9 to 14 percent slopes	300	0.1
499F	Nordness silt loam, 14 to 25 percent slopes	2,090	0.7
520	Coppock silt loam, 0 to 2 percent slopes	700	0.2
570C	Nira silty clay loam, 5 to 9 percent slopes	2,660	0.9
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded	2,060	0.7
571B	Hedrick silt loam, 2 to 5 percent slopes	250	0.1
571C2	Hedrick silt loam, 5 to 9 percent slopes, moderately eroded	2,340	0.8
594C2	Galland loam, 5 to 9 percent slopes, moderately eroded	510	0.2
594D2	Galland loam, 9 to 14 percent slopes, moderately eroded	2,270	0.8
594E	Galland loam, 14 to 18 percent slopes	1,100	0.4
594E2	Galland loam, 14 to 18 percent slopes, moderately eroded	920	0.3
730B	Nodaway-Cantril complex, 2 to 5 percent slopes	6,460	2.3
731C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded	8,290	2.9
732C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded	11,700	4.2
732D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded	800	0.3
764B	Grundy silt loam, benches, 2 to 5 percent slopes	340	0.1
779	Kalona silty clay loam, 0 to 1 percent slopes	8,600	3.1
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded	3,160	1.1
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded	660	0.2
831C2	Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded	240	0.1
832C2	Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded	420	0.2
876B	Ladoga silt loam, benches, 2 to 5 percent slopes	910	0.3
876C2	Ladoga silt loam, benches, 5 to 9 percent slopes, moderately eroded	770	0.3
880B	Clinton silt loam, benches, 2 to 5 percent slopes	1,430	0.5
880C	Clinton silt loam, benches, 5 to 9 percent slopes	380	0.1
880C2	Clinton silt loam, benches, 5 to 9 percent slopes, moderately eroded	3,190	1.1
880D2	Clinton silt loam, benches, 9 to 14 percent slopes, moderately eroded	830	0.3
881B	Otley silty clay loam, benches, 2 to 5 percent slopes	650	0.2
881C2	Otley silty clay loam, benches, 5 to 9 percent slopes, moderately eroded	250	0.1
977	Richwood silt loam, 0 to 2 percent slopes	360	0.1
977B	Richwood silt loam, 2 to 5 percent slopes	340	0.1
993D2	Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded	2,050	0.7
1057	Rushville silt loam, benches, 0 to 2 percent slopes	320	0.1
1122	Sperry silt loam, benches, 0 to 1 percent slopes	380	0.1
1130	Belinda silt loam, benches, 0 to 2 percent slopes	490	0.2
1131B	Pershing silt loam, benches, 2 to 5 percent slopes	530	0.2
1132B	Weller silt loam, benches, 2 to 5 percent slopes	550	0.2
1133	Colo silty clay loam, channeled, 0 to 2 percent slopes	770	0.3
1180B	Keomah silt loam, benches, 2 to 5 percent slopes	710	0.3
1279	Taintor silty clay loam, benches, 0 to 2 percent slopes	910	0.3
1280	Mahaska silty clay loam, benches, 0 to 2 percent slopes	410	0.1
1280B	Mahaska silty clay loam, benches, 2 to 5 percent slopes	590	0.2
1315	Klum-Perks-Nodaway complex, channeled, 1 to 3 percent slopes	970	0.4
1362	Haig silt loam, benches, 0 to 2 percent slopes	350	0.1
1779	Kalona silty clay loam, benches, 0 to 1 percent slopes	330	0.1
5010	Pits, sand and gravel	60	*
5030	Pits, limestone quarry	130	*
5040	Orthents, loamy	70	*
	Water	3,200	1.2
	Total	281,600	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
13B	Vesser-Colo complex, 2 to 5 percent slopes (where drained)
51	Vesser silt loam, 0 to 2 percent slopes (where drained)
56B	Cantril loam, 2 to 5 percent slopes (where drained)
75	Givin silt loam, 0 to 2 percent slopes (where drained)
75B	Givin silt loam, 2 to 5 percent slopes (where drained)
76B	Ladoga silt loam, 2 to 5 percent slopes
80B	Clinton silt loam, 2 to 5 percent slopes
88	Nevin silty clay loam, 0 to 2 percent slopes
110B	Lamont fine sandy loam, 2 to 5 percent slopes
122	Sperry silt loam, 0 to 1 percent slopes (where drained)
130	Belinda silt loam, 0 to 2 percent slopes (where drained)
131B	Pershing silt loam, 2 to 5 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes
133	Colo silty clay loam, 0 to 2 percent slopes (where drained)
133B	Colo silty clay loam, 2 to 5 percent slopes (where drained)
133+	Colo silt loam, overwash, 0 to 2 percent slopes (where drained)
163B	Fayette silt loam, 2 to 5 percent slopes
173	Hoopeston fine sandy loam, 0 to 2 percent slopes
175	Dickinson fine sandy loam, 0 to 2 percent slopes
180	Keomah silt loam, 0 to 2 percent slopes (where drained)
180B	Keomah silt loam, 2 to 5 percent slopes (where drained)
211	Edina silt loam, 0 to 1 percent slopes (where drained)
220	Nodaway silt loam, 0 to 2 percent slopes
264B	Ainsworth silt loam, 2 to 5 percent slopes
279	Taintor silty clay loam, 0 to 2 percent slopes (where drained)
280	Mahaska silty clay loam, 0 to 2 percent slopes
280B	Mahaska silty clay loam, 2 to 5 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes
362	Haig silt loam, 0 to 2 percent slopes (where drained)
363	Haig silty clay loam, 0 to 2 percent slopes (where drained)
364B	Grundy silt loam, 2 to 5 percent slopes
453	Tuskeego silt loam, 0 to 2 percent slopes (where drained)
484	Lawson silt loam, 0 to 2 percent slopes
520	Coppock silt loam, 0 to 2 percent slopes (where drained)
571B	Hedrick silt loam, 2 to 5 percent slopes
730B	Nodaway-Cantril complex, 2 to 5 percent slopes (where drained and protected from flooding)
764B	Grundy silt loam, benches, 2 to 5 percent slopes
779	Kalona silty clay loam, 0 to 1 percent slopes (where drained)
876B	Ladoga silt loam, benches, 2 to 5 percent slopes
880B	Clinton silt loam, benches, 2 to 5 percent slopes
881B	Otley silty clay loam, benches, 2 to 5 percent slopes
977	Richwood silt loam, 0 to 2 percent slopes
977B	Richwood silt loam, 2 to 5 percent slopes
1057	Rushville silt loam, benches, 0 to 2 percent slopes (where drained)
1122	Sperry silt loam, benches, 0 to 1 percent slopes (where drained)
1130	Belinda silt loam, benches, 0 to 2 percent slopes (where drained)
1131B	Pershing silt loam, benches, 2 to 5 percent slopes
1132B	Weller silt loam, benches, 2 to 5 percent slopes
1180B	Keomah silt loam, benches, 2 to 5 percent slopes (where drained)
1279	Taintor silty clay loam, benches, 0 to 2 percent slopes (where drained)
1280	Mahaska silty clay loam, benches, 0 to 2 percent slopes
1280B	Mahaska silty clay loam, benches, 2 to 5 percent slopes
1362	Haig silt loam, benches, 0 to 2 percent slopes (where drained)
1779	Kalona silty clay loam, benches, 0 to 1 percent slopes (where drained)

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
13B: Vesser-Colo	90	34	50	4.0	5.1	3.6
23C: Arispe	105	40	79	4.4	6.3	3.8
23C2: Arispe	102	39	76	4.3	6.1	3.7
41B: Sparta	61	23	45	2.6	3.5	2.3
51: Vesser	95	36	52	4.0	5.0	3.7
56B: Cantril	94	36	52	4.0	5.0	3.3
58E: Douds	---	---	22	2.2	3.3	1.7
58F: Douds	---	---	---	1.3	2.4	1.3
65E: Lindley	---	---	---	2.0	2.8	2.0
65E2: Lindley	---	---	---	1.5	2.3	2.0
65F, 65G: Lindley	---	---	---	---	1.7	1.7
75: Givin	119	45	65	5.0	8.3	4.2
75B: Givin	117	43	64	4.9	8.1	4.2
76B: Ladoga	113	43	62	4.7	6.8	4.3
76C: Ladoga	108	41	59	4.5	6.5	4.0
76C2: Ladoga	105	40	57	4.4	6.3	3.9
76D2: Ladoga	96	36	53	4.0	5.7	3.7
80B: Clinton	107	41	59	4.5	6.4	4.0
80C: Clinton	102	39	56	4.3	6.1	3.8
80C2: Clinton	99	38	54	4.2	6.0	3.6
80D: Clinton	93	35	51	3.9	5.6	3.6

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
80D2----------------------- Clinton	90	34	50	3.8	5.3	3.5
88----------------------- Nevin	114	43	63	4.8	8.0	4.0
110B----------------------- Lamont	69	26	52	2.5	3.5	2.3
110C----------------------- Lamont	64	24	48	2.3	3.3	2.1
122----------------------- Sperry	97	37	53	3.5	5.1	3.6
130----------------------- Belinda	87	33	48	3.7	5.1	3.7
131B----------------------- Pershing	101	38	56	4.2	6.0	3.8
131C----------------------- Pershing	96	36	53	4.0	5.7	3.5
132B----------------------- Weller	95	36	52	4.0	5.6	3.8
132C----------------------- Weller	90	34	50	3.8	5.4	3.7
133, 133B----------------- Colo	104	40	78	4.2	5.5	4.2
133+----------------------- Colo	109	42	82	4.3	5.8	4.2
154E----------------------- Ainsworth-Lamont	---	---	---	2.9	4.3	2.4
163B----------------------- Fayette	113	43	90	4.7	6.6	4.0
163C2----------------------- Fayette	105	40	84	4.4	6.5	3.6
173----------------------- Hoopeston	90	36	76	4.0	4.8	3.3
175----------------------- Dickinson	83	32	62	3.0	5.0	2.7
179E----------------------- Gara	---	---	---	2.5	3.3	1.7
179E2----------------------- Gara	---	---	---	2.2	2.8	1.5
180----------------------- Keomah	113	43	62	4.8	8.0	4.3
180B----------------------- Keomah	111	42	61	4.7	7.8	4.1
192D2----------------------- Adair	54	20	30	2.3	2.9	1.9
208----------------------- Klum	81	31	44	3.4	4.8	2.6

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
211----------------------- Edina	86	33	47	3.6	4.5	3.3
220----------------------- Nodaway	110	42	60	4.6	6.5	4.0
222C---------------------- Clarinda	63	24	34	2.6	3.7	2.7
222C2--------------------- Clarinda	55	21	30	2.2	3.3	2.3
223C2--------------------- Rinda	52	20	29	2.1	3.3	2.3
223D2--------------------- Rinda	42	16	23	1.7	2.5	1.7
260----------------------- Beckwith	76	23	42	3.3	4.5	3.0
263----------------------- Okaw	70	27	42	2.9	3.8	3.0
263B---------------------- Okaw	68	26	41	2.8	3.6	3.0
264B---------------------- Ainsworth	98	37	52	4.1	6.0	3.1
264C2--------------------- Ainsworth	90	34	47	3.8	5.6	2.7
279----------------------- Taintor	117	44	64	4.7	7.0	4.2
280----------------------- Mahaska	125	48	69	5.2	7.5	4.5
280B---------------------- Mahaska	119	45	65	5.0	7.1	4.2
281B---------------------- Otley	119	45	65	5.0	7.1	4.3
281C, 281C2--------------- Otley	114	43	63	4.8	6.8	4.0
293B---------------------- Chelsea-Lamont-Fayette	78	29	60	3.0	4.4	2.7
293C---------------------- Chelsea-Lamont-Fayette	72	27	57	2.8	4.3	2.4
293E---------------------- Chelsea-Lamont-Fayette	---	---	---	2.4	3.6	2.2
293F---------------------- Chelsea-Lamont-Fayette	---	---	---	---	2.5	1.7
315----------------------- Klum-Perks-Nodaway	70	25	38	2.7	5.0	2.4
362, 363------------------ Haig	105	40	58	4.2	6.2	3.8
364B---------------------- Grundy	107	41	59	4.5	6.5	3.8
424D---------------------- Lindley-Keswick	63	24	36	2.7	3.9	2.4

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
424D2 Lindley-Keswick	59	22	33	2.5	3.6	2.0
424E Lindley-Keswick	---	---	---	1.8	2.5	1.8
424E2 Lindley-Keswick	---	---	---	1.3	2.0	1.6
425D Keswick	52	20	29	2.2	3.1	1.9
425D2 Keswick	44	17	24	1.8	2.7	1.3
452D2 Lineville	60	22	30	2.5	3.1	2.5
453 Tuskeego	88	31	45	3.3	4.3	3.3
478G Nordness-Rock outcrop	---	---	---	---	---	---
484 Lawson	119	45	90	5.0	7.1	4.1
499D Nordness	---	---	---	1.2	1.2	1.0
499F Nordness	---	---	---	0.5	0.8	0.7
520 Coppock	89	34	49	3.7	4.7	3.3
570C Nira	109	41	60	4.6	6.5	4.1
570C2 Nira	106	40	58	4.5	6.3	3.9
571B Hedrick	109	41	60	4.6	6.6	4.0
571C2 Hedrick	101	38	55	4.2	6.1	3.6
594C2 Galland	54	20	30	2.3	3.1	1.9
594D2 Galland	45	17	25	1.8	2.7	1.3
594E Galland	---	---	---	1.4	2.0	1.5
594E2 Galland	---	---	---	1.0	1.5	1.0
730B Nodaway-Cantril	89	32	52	3.3	5.4	3.8
731C2 Pershing	91	33	50	3.8	5.4	3.4
732C2 Weller	85	32	46	3.2	5.0	3.3

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
732D2----------------------- Weller	76	29	42	2.8	4.5	2.7
764B----------------------- Grundy	107	41	59	4.5	6.5	3.8
779----------------------- Kalona	115	44	64	4.7	7.8	4.2
792D2----------------------- Armstrong	50	19	28	2.0	2.7	1.7
795D2----------------------- Ashgrove	40	---	22	1.8	1.7	1.5
831C2----------------------- Pershing	91	33	50	3.8	5.4	3.4
832C2----------------------- Weller	85	32	46	3.2	5.0	3.3
876B----------------------- Ladoga	113	43	62	4.7	6.8	4.3
876C2----------------------- Ladoga	105	40	57	4.4	6.3	3.9
880B----------------------- Clinton	107	41	59	4.5	6.4	4.0
880C----------------------- Clinton	102	39	56	4.3	6.1	3.8
880C2----------------------- Clinton	99	38	54	4.2	6.0	3.6
880D2----------------------- Clinton	90	34	50	3.8	5.3	3.5
881B----------------------- Otley	119	45	65	5.0	7.1	4.3
881C2----------------------- Otley	111	42	61	4.7	6.6	3.9
977----------------------- Richwood	122	46	98	5.1	7.3	4.1
977B----------------------- Richwood	120	45	96	5.0	7.1	4.0
993D2----------------------- Gara-Armstrong	67	25	36	2.8	3.9	2.3
1057----------------------- Rushville	88	33	48	3.7	5.3	3.6
1122----------------------- Sperry	97	37	53	3.5	5.1	3.6
1130----------------------- Belinda	87	33	48	3.7	5.1	3.7
1131B----------------------- Pershing	101	38	56	4.2	6.0	3.8
1132B----------------------- Weller	95	36	52	4.0	5.6	3.8

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Map symbol and soil name	Corn	Soybeans	Oats	Grass-legume hay	Smooth bromegrass	Kentucky bluegrass
	Bu	Bu	Bu	Tons	AUM*	AUM*
1133----------------------- Colo	---	---	---	---	---	3.0
1180B---------------------- Keomah	111	42	61	4.7	7.8	4.1
1279----------------------- Taintor	117	44	64	4.7	7.0	4.2
1280----------------------- Mahaska	125	48	69	5.2	7.5	4.5
1280B---------------------- Mahaska	119	45	65	5.0	7.1	4.2
1315----------------------- Klum-Perks-Nodaway	---	---	---	---	---	2.0
1362----------------------- Haig	105	40	58	4.2	6.2	3.8
1779----------------------- Kalona	115	44	64	4.7	7.8	4.2
5010, 5030. Pits						
5040. Orthents						

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
41B----------------- Sparta	3s	Slight	Slight	Severe	Slight	Northern red oak---- Red pine------------ Eastern white pine-- Jack pine-----------	70 --- --- ---	Eastern white pine, red pine, jack pine.
56B----------------- Cantril	2o	Slight	Slight	Slight	Slight	White oak-----------	75	Eastern white pine, red pine, sugar maple.
58E, 58F----------- Douds	4r	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	55 55	Eastern white pine, red pine, European larch, sugar maple.
65E----------------- Lindley	4r	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	60 60	White oak, green ash, northern red oak, black oak.
65E2---------------- Lindley	4r	Moderate	Moderate	Moderate	Slight	White oak----------- Northern red oak----	60 60	White oak, green ash, black oak.
65F, 65G----------- Lindley	4r	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak----	60 60	White oak, green ash, northern red oak, black oak.
75, 75B------------ Givin	3o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	65 65	Eastern white pine, red pine, black walnut, sugar maple, white oak, northern red oak.
76B, 76C, 76C2, 76D2--------------- Ladoga	2o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	75 75	Eastern white pine, red pine, white oak, sugar maple, northern red oak, European larch, black walnut.
80B, 80C, 80C2, 80D, 80D2---------- Clinton	3o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	65 65	Eastern white pine, red pine, black walnut, white oak, European larch, northern red oak.
110B, 110C---------- Lamont	4o	Slight	Slight	Slight	Slight	Northern red oak---- White oak-----------	55 55	Eastern white pine.
130----------------- Belinda	5w	Slight	Severe	Moderate	Moderate	White oak-----------	45	Eastern cottonwood, silver maple, American sycamore, green ash.
131B, 131C---------- Pershing	4c	Slight	Slight	Severe	Moderate	White oak-----------	55	Eastern white pine, white oak, red pine.
132B, 132C---------- Weller	4c	Slight	Slight	Severe	Moderate	White oak-----------	55	Eastern white pine, red pine, black walnut, sugar maple.
154E*: Ainsworth----------	3o	Slight	Slight	Slight	Slight	Green ash-----------	80	Eastern white pine, red pine, sugar maple, northern red oak, white oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
154E*: Lamont	4o	Slight	Slight	Slight	Slight	Northern red oak White oak	55 55	Eastern white pine.
163B, 163C2: Fayette	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	Eastern white pine, northern red oak, green ash.
179E, 179E2: Gara	4r	Moderate	Moderate	Slight	Slight	White oak Northern red oak	55 55	Eastern white pine, red pine, white oak, northern red oak.
180, 180B: Keomah	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 70	Eastern white pine, white oak, red pine, northern red oak, black walnut, sugar maple.
208: Klum	1o	Slight	Slight	Slight	Slight	Eastern cottonwood American sycamore Green ash	106 --- ---	Eastern cottonwood, yellow-poplar, American sycamore, green ash, black walnut, eastern white pine, sugar maple.
220: Nodaway	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, black walnut, sugar maple, European larch.
223C2, 223D2: Rinda	5w	Slight	Severe	Moderate	Severe	White oak Northern red oak	45 45	Silver maple, American sycamore, green ash, hackberry.
260: Beckwith	5w	Slight	Severe	Moderate	Moderate	White oak	45	Eastern cottonwood, silver maple, American sycamore, green ash.
263, 263B: Okaw	4w	Slight	Severe	Severe	Moderate	Eastern cottonwood Silver maple	80 70	Eastern cottonwood, silver maple, laurel willow, American sycamore, green ash.
264B, 264C2: Ainsworth	3o	Slight	Slight	Slight	Slight	Green ash Silver maple	80 ---	Eastern white pine, red pine, sugar maple, northern red oak, white oak.
293B*, 293C*, 293E*:								
Chelsea	4s	Slight	Slight	Moderate	Slight	White oak	55	Eastern white pine, European larch, red pine, jack pine.
Lamont	4o	Slight	Slight	Slight	Slight	Northern red oak White oak	55 55	Eastern white pine.
Fayette	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	Eastern white pine, northern red oak, green ash.
293F*: Chelsea	4s	Moderate	Severe	Moderate	Slight	White oak	55	Eastern white pine, European larch, red pine, jack pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
293F*:								
Lamont	4o	Slight	Slight	Slight	Slight	Northern red oak White oak	55 55	Eastern white pine,
Fayette	2r	Moderate	Moderate	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	80 80 90 ---	Eastern white pine, northern red oak, green ash.
315*:								
Klum	1o	Slight	Slight	Slight	Slight	Eastern cottonwood American sycamore Green ash	105 --- ---	Eastern cottonwood, yellow-poplar, American sycamore, green ash, black walnut, eastern white pine, sugar maple.
Perks	4s	Slight	Slight	Moderate	Slight	White oak	55	Eastern white pine.
Nodaway	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, black walnut, sugar maple, European larch.
424D*:								
Lindley	4o	Slight	Slight	Slight	Slight	White oak Northern red oak	60 60	White oak, green ash, northern red oak, black oak.
Keswick	4c	Slight	Slight	Slight	Severe	White oak Northern red oak	55 55	Eastern white pine, red pine, sugar maple.
424D2*:								
Lindley	4o	Slight	Slight	Slight	Slight	White oak Northern red oak	60 60	White oak, green ash, black oak.
Keswick	4c	Slight	Slight	Slight	Moderate	White oak Northern red oak	55 55	Eastern white pine, red pine, sugar maple.
424E*:								
Lindley	4r	Moderate	Moderate	Slight	Slight	White oak Northern red oak	60 55	White oak, green ash, northern red oak,; black oak.
Keswick	4c	Moderate	Moderate	Slight	Severe	White oak Northern red oak	55 60	Eastern white pine, red pine, sugar maple.
424E2*:								
Lindley	4r	Moderate	Moderate	Moderate	Slight	White oak Northern red oak	60 60	White oak, green ash, black oak.
Keswick	4c	Moderate	Moderate	Slight	Severe	White oak Northern red oak	55 55	Eastern white pine, red pine, sugar maple.
425D, 425D2 Keswick	4c	Slight	Slight	Slight	Slight	White oak Northern red oak	55	Eastern white pine, red pine, sugar maple.
452D2 Lineville	4o	Slight	Slight	Slight	Slight	White oak	55	Eastern white pine, red pine, sugar maple.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
453 Tuskeego	3w	Slight	Severe	Moderate	Moderate	Eastern cottonwood Silver maple	90 80	Eastern cottonwood, silver maple, laurel willow, American sycamore, green ash, northern white-cedar.
478G*: Nordness	5d	Moderate	Moderate	Severe	Moderate	Northern red oak White oak	45 45	---
Rock outcrop.								
499D, 499F Nordness	4d	Moderate	Moderate	Severe	Moderate	Northern red oak White oak	45 45	---
520 Coppock	3o	Slight	Slight	Slight	Slight	White oak Northern red oak	65 65	Eastern white pine, red pine, sugar maple.
571B, 571C2 Hedrick	2o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, red pine, sugar maple.
594C2, 594D2 Galland	3c	Slight	Slight	Severe	Moderate	White oak Northern red oak	65 70	Eastern white pine, red pine, black walnut, sugar maple.
594E, 594E2 Galland	3c	Moderate	Moderate	Severe	Moderate	White oak Northern red oak	65 70	Eastern white pine, red pine, black walnut, sugar maple.
730B: Nodaway	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, red pine, black walnut, sugar maple, European larch.
Cantril	2o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, red pine, sugar maple.
731C2 Pershing	4c	Slight	Slight	Severe	Moderate	White oak	55	Eastern white pine, white oak, red pine.
732C2,732D2 Weller	4c	Slight	Slight	Severe	Moderate	White oak	55	Eastern white pine, red pine, black walnut, sugar maple.
792D2 Armstrong	4c	Slight	Slight	Severe	Severe	White oak Northern red oak	55 55	Eastern white pine, red pine, European larch, sugar maple.
795D2 Ashgrove	5w	Slight	Severe	Moderate	Severe	White oak Northern red oak	45 45	Silver maple, American sycamore, green ash, hackberry.
831C2 Pershing	4c	Slight	Slight	Severe	Moderate	White oak	55	Eastern white pine, white oak, red pine.
832C2 Weller	4c	Slight	Slight	Severe	Moderate	White oak	55	Eastern white pine, red pine, black walnut, sugar maple.
876B, 876C2 Ladoga	2o	Slight	Slight	Slight	Slight	White oak Northern red oak	75 75	Eastern white pine, red pine, white oak, sugar maple, northern red oak, European larch, black walnut.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Map symbol and soil name	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
880B, 880C, 880C2, 880D2------------- Clinton	3o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	65 65	Eastern white pine, red pine, black walnut, white oak, European larch, northern red oak.
993D2*:								
Gara---------------	4o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	55 55	Eastern white pine, red pine, white oak, northern red oak.
Armstrong---------	4c	Slight	Slight	Severe	Severe	White oak----------- Northern red oak----	55 55	Eastern white pine, red pine, European larch, sugar maple.
1057--------------- Rushville	5w	Slight	Severe	Moderate	Moderate	White oak-----------	45	Pin oak, green ash, European larch.
1130--------------- Belinda	5w	Slight	Severe	Moderate	Moderate	White oak-----------	45	Eastern cottonwood, silver maple, American sycamore, green ash.
1131B-------------- Pershing	4c	Slight	Slight	Severe	Moderate	White oak-----------	55	Eastern white pine, white oak, red pine.
1132B-------------- Weller	4c	Slight	Slight	Severe	Moderate	White oak-----------	55	Eastern white pine, red pine, sugar maple.
1180B-------------- Keomah	3o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak----	65 70	Eastern white pine, white oak, red pine, northern red oak, black walnut, sugar maple.
1315*:								
Klum---------------	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore--- Green ash-----------	106 --- ---	Eastern cottonwood, yellow-poplar, American sycamore, green ash, black walnut, eastern white pine, sugar maple.
Perks--------------	4s	Slight	Slight	Moderate	Slight	White oak-----------	55	Eastern white pine.
Nodaway------------	3o	Slight	Slight	Slight	Slight	White oak-----------	65	Eastern white pine, red pine, black walnut, sugar maple, European larch.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
13B*:					
Vesser	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
23C, 23C2 Arispe	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
41B Sparta	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
51 Vesser	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
56B Cantril	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
58E, 58F Douds	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Blue spruce, white fir, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
65E, 65E2, 65F, 65G Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
75, 75B----------- Givin	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
76B, 76C, 76C2, 76D2------------- Ladoga	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
80B, 80C, 80C2, 80D, 80D2-------- Clinton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
88--------------- Nevin	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
110B, 110C-------- Lamont	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, eastern redcedar, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
122--------------- Sperry	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
130--------------- Belinda	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Norway spruce, blue spruce, northern white-cedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
131B, 131C-------- Pershing	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
132B, 132C. Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
133, 133B, 133+. Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
154E*:					
Ainsworth	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
Lamont	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, eastern redcedar, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
163B, 163C2. Fayette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
173. Hoopeston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
175. Dickinson	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
179E, 179E2. Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
180, 180B. Keomah	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
192D2. Adair	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
208. Klum	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
211. Edina	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, northern white-cedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
220. Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
222C, 222C2. Clarinda	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Green ash, osageorange.	Eastern white pine, pin oak, Austrian pine.	---
223C2, 223D2. Rinda	---	Eastern redcedar, Washington hawthorn, arrowwood, Amur privet, American cranberrybush, Tatarian honeysuckle, Amur honeysuckle.	Green ash, Austrian pine, osageorange.	Eastern white pine, pin oak.	---
260. Beckwith	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
263, 263B. Okaw	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
264B, 264C2. Ainsworth	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
279. Taintor	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Washington hawthorn, northern white-cedar, Norway spruce, blue spruce, white fir.	Eastern white pine	Pin oak.
280, 280B. Mahaska	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, eastern white pine, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
281B, 281C, 281C2. Otley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
293B*, 293C*, 293E*, 293F*:					
Chelsea	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Lamont	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, eastern redcedar, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
Fayette	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
315*:					
Klum	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
Perks	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
362, 363 Haig	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
364B Grundy	---	Washington hawthorn, Tatarian honeysuckle, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, eastern redcedar.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
424D*, 424D2*, 424E*, 424E2*:					
Lindley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Keswick	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
425D, 425D2 Keswick	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
452D2. Lineville	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
453. Tuskeego	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
478G*: Nordness.					
Rock outcrop.					
484. Lawson	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
499D, 499F. Nordness					
520. Coppock	---	Amur privet, silky dogwood, Amur honeysuckle.	Austrian pine, northern white-cedar, white fir, blue spruce, Washington hawthorn, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
570C, 570C2. Nira	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern white-cedar.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
571B, 571C2. Hedrick	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
594C2, 594D2, 594E, 594E2. Galland	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
730B*:					
Nodaway----------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Cantril----------	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
731C2------------- Pershing	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
732C2, 732D2------ Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
764B-------------- Grundy	---	Washington hawthorn, Tatarian honeysuckle, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, eastern redcedar.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
779--------------- Kalona	---	Amur privet, Tatarian honeysuckle, silky dogwood, American cranberrybush.	Norway spruce, northern white-cedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
792D2------------- Armstrong	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Tatarian honeysuckle, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
795D2: Ashgrove	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
831C2: Pershing	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
832C2: Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
876B, 876C2: Ladoga	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
880B, 880C, 880C2, 880D2: Clinton	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
881B, 881C2: Otley	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
977, 977B: Richwood	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
993D2*: Gara	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
993D2*:					
Armstrong--------	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Tatarian honeysuckle, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
1057-------------- Rushville	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
1122-------------- Sperry	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
1130-------------- Belinda	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Norway spruce, blue spruce, northern white-cedar, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
1131B------------- Pershing	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
1132B------------- Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
1133-------------- Colo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1180B. Keomah	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
1279. Taintor	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Austrian pine, Washington hawthorn, northern white-cedar, Norway spruce, blue spruce, white fir.	Eastern white pine	Pin oak.
1280, 1280B. Mahaska	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, eastern white pine, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
1315*: Klum	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
Perks	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
Nodaway	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
1362. Haig	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, blue spruce, white fir, northern white-cedar, Washington hawthorn.	Eastern white pine	Pin oak.
1779. Kalona	---	Amur privet, Tatarian honeysuckle, silky dogwood, American cranberrybush.	Norway spruce, northern white-cedar, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
13B*:					
Vesser	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
23C, 23C2 Arispe	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight	Slight.
41B Sparta	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
51 Vesser	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
56B Cantril	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
58E Douds	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
58F Douds	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65E, 65E2, 65F Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65G Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
75 Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight	Slight.
75B Givin	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
76B Ladoga	Slight	Slight	Moderate: slope.	Slight	Slight.
76C, 76C2 Ladoga	Slight	Slight	Severe: slope.	Slight	Slight.
76D2 Ladoga	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
80B Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
80C, 80C2----- Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
80D, 80D2----- Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
88----- Nevin	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Slight-----	Slight.
110B----- Lamont	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
110C----- Lamont	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.
122----- Sperry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
130----- Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
131B----- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
131C----- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight-----	Slight.
132B----- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
132C----- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight-----	Slight.
133, 133B, 133+----- Colo	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
154E*:					
Ainsworth-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Lamont-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
163B----- Fayette	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
163C2----- Fayette	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.
173----- Hoopeston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
175----- Dickinson	Slight-----	Slight-----	Slight-----	Slight-----	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
179E, 179E2----------- Gara	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
180------------------- Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight----------	Slight.
180B------------------ Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight----------	Slight.
192D2----------------- Adair	Severe: wetness.	Moderate: wetness, slope, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
208------------------- Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
211------------------- Edina	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
220------------------- Nodaway	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
222C, 222C2----------- Clarinda	Severe: percs slowly, wetness.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
223C2----------------- Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
223D2----------------- Rinda	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
260------------------- Beckwith	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
263, 263B------------- Okaw	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
264B------------------ Ainsworth	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
264C2----------------- Ainsworth	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
279------------------- Taintor	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
280------------------- Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
280B------------------- Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight----------	Slight.
281B------------------- Otley	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
281C, 281C2------------ Otley	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
293B*:					
Chelsea---------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
Lamont----------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Fayette---------------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
293C*:					
Chelsea---------------	Slight----------	Slight----------	Severe: slope.	Slight----------	Moderate: droughty.
Lamont----------------	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
Fayette---------------	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
293E*:					
Chelsea---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, droughty.
Lamont----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
Fayette---------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
293F*:					
Chelsea---------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Lamont----------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Fayette---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
315*:					
Klum------------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Perks-----------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding, droughty.
Nodaway---------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
362, 363--------------- Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
364B------------------ Grundy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
424D*, 424D2*:					
Lindley--------------	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
Keswick--------------	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
424E*, 424E2*:					
Lindley--------------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Keswick--------------	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.
425D, 425D2----------- Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
452D2----------------- Lineville	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
453------------------- Tuskeego	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
478G*:					
Nordness-------------	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
Rock outcrop.					
484------------------- Lawson	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
499D------------------ Nordness	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.
499F------------------ Nordness	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.
520------------------- Coppock	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
570C, 570C2----------- Nira	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
571B------------------ Hedrick	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
571C2----------------- Hedrick	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
594C2----------------- Galland	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight----------	Slight.
594D2----------------- Galland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
594E, 594E2----------- Galland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
730B*:					
Nodaway---------------	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Cantril---------------	Severe: flooding.	Moderate: wetness.	Moderate: slope, wetness.	Slight----------	Slight.
731C2----------------- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
732C2----------------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
732D2----------------- Weller	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
764B------------------ Grundy	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
779------------------- Kalona	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
792D2----------------- Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
795D2----------------- Ashgrove	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
831C2----------------- Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
832C2----------------- Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Slight----------	Slight.
876B------------------ Ladoga	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
876C2----------------- Ladoga	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
880B: Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
880C, 880C2: Clinton	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight	Slight.
880D2: Clinton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
881B: Otley	Slight	Slight	Moderate: slope.	Slight	Slight.
881C2: Otley	Slight	Slight	Severe: slope.	Slight	Slight.
977: Richwood	Slight	Slight	Slight	Slight	Slight.
977B: Richwood	Slight	Slight	Moderate: slope.	Slight	Slight.
993D2*:					
Gara	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Armstrong	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
1057: Rushville	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1122: Sperry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
1130: Belinda	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1131B: Pershing	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
1132B: Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
1133: Colo	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: flooding, wetness.	Severe: flooding.
1180B: Keomah	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1279 Taintor	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1280 Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
1280B Mahaska	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
1315*:					
Klum	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Perks	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding, droughty.
Nodaway	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
1362 Haig	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
1779 Kalona	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
13B*:										
Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
23C, 23C2 Arispe	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.
41B Sparta	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
51 Vesser	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
56B Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
58E, 58F Douds	Very poor.	Good	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
65E, 65E2, 65F Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65G Lindley	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
75, 75B Givin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
76B Ladoga	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
76C, 76C2, 76D2 Ladoga	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
80B Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
80C, 80C2, 80D, 80D2 Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
88 Nevin	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
110B Lamont	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
110C Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
122 Sperry	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
130 Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
131B Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
131C Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
132B: Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
132C: Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
133, 133B, 133+: Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
154E*:										
Ainsworth	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
Lamont	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
163B: Fayette	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
163C2: Fayette	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
173: Hoopeston	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
175: Dickinson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
179E, 179E2: Gara	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
180, 180B: Keomah	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.
192D2: Adair	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
208: Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
211: Edina	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
220: Nodaway	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
222C, 222C2: Clarinda	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
223C2, 223D2: Rinda	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
260: Beckwith	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
263: Okaw	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
263B: Okaw	Fair	Fair	Fair	Fair	Poor	Good	Poor	Fair	Fair	Fair.
264B: Ainsworth	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
264C2: Ainsworth	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
279------------------ Taintor	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
280, 280B----------- Mahaska	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
281B---------------- Otley	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
281C, 281C2--------- Otley	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
293B*:										
Chelsea------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Lamont-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Fayette------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293C*:										
Chelsea------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Lamont-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fayette------------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293E*:										
Chelsea------------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fayette------------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293F*:										
Chelsea------------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Lamont-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fayette------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
315*:										
Klum---------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Perks--------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Nodaway------------	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
362, 363------------ Haig	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
364B---------------- Grundy	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
424D*, 424D2*:										
Lindley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
424E*, 424E2*:										
Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Keswick	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
425D, 425D2 Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
452D2 Lineville	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Poor.
453 Tuskeego	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
478G*:										
Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
484 Lawson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
499D Nordness	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
499F Nordness	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
520 Coppock	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
570C, 570C2 Nira	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
571B Hedrick	Good	Good	Fair	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
571C2 Hedrick	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
594C2, 594D2 Galland	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
594E, 594E2 Galland	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
730B*:										
Nodaway	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
Cantril	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
731C2 Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
732C2, 732D2 Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
764B---------------- Grundy	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
779----------------- Kalona	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
792D2--------------- Armstrong	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
795D2--------------- Ashgrove	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
831C2--------------- Pershing	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
832C2--------------- Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
876B---------------- Ladoga	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
876C2--------------- Ladoga	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
880B---------------- Clinton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
880C, 880C2, 880D2- Clinton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
881B---------------- Otley	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
881C2--------------- Otley	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
977, 977B----------- Richwood	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
993D2*:										
Gara----------------	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
Armstrong-----------	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
1057---------------- Rushville	Poor	Fair	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
1122---------------- Sperry	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1130---------------- Belinda	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1131B--------------- Pershing	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
1132B--------------- Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
1133---------------- Colo	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
1180B--------------- Keomah	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1279: Taintor	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1280, 1280B: Mahaska	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
1315*:										
Klum	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Perks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Nodaway	Poor	Fair	Fair	Poor	Poor	Good	Fair	Poor	Poor	Fair.
1362: Haig	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
1779: Kalona	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
5010*, 5030*. Pits										
5040*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
13B*:						
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
23C, 23C2 Arispe	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action, shrink-swell.	Slight.
41B Sparta	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
51 Vesser	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
56B Cantril	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
58E, 58F Douds	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
65E, 65E2, 65F, 65G Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
75, 75B Givin	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
76B Ladoga	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
76C, 76C2 Ladoga	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
76D2 Ladoga	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
80B Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
80C, 80C2 Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80D, 80D2 Clinton	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
88 Nevin	Severe: wetness.	Severe: flooding.	Severe: wetness, flooding.	Severe: flooding.	Severe: frost action, low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
110B Lamont	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
110C Lamont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
122 Sperry	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
130 Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
131B, 131C Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132B, 132C Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
133, 133B, 133+ Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
154E*: Ainsworth	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, frost action, slope.	Severe: slope.
Lamont	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
163B Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
163C2 Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
173 Hoopeston	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
175 Dickinson	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
179E, 179E2 Gara	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
180, 180B Keomah	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
192D2 Adair	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness.	Severe: shrink-swell, wetness, slope.	Severe: low strength, frost action.	Moderate: slope, wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
208 Klum	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
211 Edina	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
220 Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Moderate: flooding.
222C, 222C2 Clarinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness.
223C2 Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness.
223D2 Rinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness, slope.
260 Beckwith	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
263, 263B Okaw	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, wetness.	Severe: wetness, flooding.
264B Ainsworth	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
264C2 Ainsworth	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
279 Taintor	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
280, 280B Mahaska	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength, frost action.	Slight.
281B Otley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
281C, 281C2 Otley	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
293B*:						
Chelsea	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Lamont	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
293B*:						
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
293C*:						
Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Lamont	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Fayette	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
293E*:						
Chelsea	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamont	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
293F*:						
Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Lamont	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
315*:						
Klum	Moderate: wetness, flooding	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Perks	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, droughty.
Nodaway	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Severe: flooding.
362, 363 Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
364B Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
424D*, 424D2*:						
Lindley	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
424E*, 424E2*:						
Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Keswick	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: low strength, slope, frost action.	Severe: slope.
425D, 425D2 Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
452D2 Lineville	Severe: wetness.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
453 Tuskeego	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
478G*:						
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
484 Lawson	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
499D Nordness	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: thin layer.
499F Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, thin layer.
520 Coppock	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, low strength, frost action.	Moderate: wetness, flooding.
570C, 570C2 Nira	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
571B Hedrick	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
571C2 Hedrick	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
594C2------------- Galland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, frost action.	Slight.
594D2------------- Galland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, frost action.	Moderate: slope.
594E, 594E2------- Galland	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, frost action.	Severe: slope.
730B*:						
Nodaway----------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Severe: flooding.
Cantril----------	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Slight.
731C2------------- Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
732C2------------- Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
732D2------------- Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell, slope.	Severe: shrink-swell, frost action, low strength.	Moderate: slope.
764B-------------- Grundy	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
779--------------- Kalona	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
792D2------------- Armstrong	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness, slope.	Severe: low strength, frost action.	Moderate: slope, wetness.
795D2------------- Ashgrove	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, slope.
831C2------------- Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832C2------------- Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
876B--------------- Ladoga	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
876C2-------------- Ladoga	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
880B--------------- Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
880C, 880C2------- Clinton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
880D2-------------- Clinton	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
881B--------------- Otley	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
881C2-------------- Otley	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
977, 977B--------- Richwood	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action.	Slight.
993D2*:						
Gara--------------	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Armstrong---------	Severe: wetness.	Severe: shrink-swell, wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, wetness, slope.	Severe: low strength, frost action.	Moderate: slope, wetness.
1057--------------- Rushville	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action.	Severe: wetness.
1122--------------- Sperry	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
1130--------------- Belinda	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, wetness, shrink-swell.	Severe: wetness.
1131B-------------- Pershing	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
1132B-------------- Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
1133--------------- Colo	Severe: wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, shrink-swell, wetness.	Severe: flooding, low strength, frost action.	Severe: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1180B-------------- Keomah	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
1279--------------- Taintor	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
1280, 1280B-------- Mahaska	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength, frost action.	Slight.
1315*:						
Klum---------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
Perks--------------	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, droughty.
Nodaway------------	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action, low strength.	Severe: flooding.
1362--------------- Haig	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
1779--------------- Kalona	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
5010*, 5030*. Pits						
5040*. Orthents						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13B*:					
Vesser	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
23C, 23C2 Arispe	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
41B Sparta	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
51 Vesser	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
56B Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
58E, 58F Douds	Severe: slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: seepage, slope.	Poor: slope.
65E, 65E2, 65F, 65G Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
75, 75B Givin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
76B Ladoga	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
76C, 76C2 Ladoga	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
76D2 Ladoga	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
80B Clinton	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
80C, 80C2 Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
80D, 80D2 Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
88 Nevin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
110B----------------- Lamont	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
110C----------------- Lamont	Slight-----------	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Good.
122------------------ Sperry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
130------------------ Belinda	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
131B----------------- Pershing	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
131C----------------- Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
132B----------------- Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness	Severe: wetness.	Poor: too clayey, hard to pack.
132C----------------- Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
133, 133B, 133+----- Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.
154E*:					
Ainsworth-----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Lamont--------------	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
163B----------------- Fayette	Slight-----------	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
163C2---------------- Fayette	Slight-----------	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
173------------------ Hoopeston	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
175------------------ Dickinson	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
179E, 179E2--------- Gara	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
180, 180B----------- Keomah	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
192D2--------------- Adair	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
208----------------- Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
211----------------- Edina	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
220----------------- Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
222C, 222C2--------- Clarinda	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
223C2, 223D2-------- Rinda	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, wetness, hard to pack.
260----------------- Beckwith	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
263----------------- Okaw	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
263B---------------- Okaw	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
264B---------------- Ainsworth	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
264C2--------------- Ainsworth	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey, thin layer.
279----------------- Taintor	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
280, 280B----------- Mahaska	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
281B---------------- Otley	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
281C, 281C2 Otley	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
293B*:					
Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Lamont	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Fayette	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
293C*:					
Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Lamont	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Good.
Fayette	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
293E*:					
Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: slope, seepage, too sandy.	Severe: slope, seepage.	Poor: slope, too sandy, seepage.
Lamont	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
293F*:					
Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
Lamont	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Fayette	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
315*:					
Klum	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Perks	Severe: flooding, poor filter.	Severe: flooding, seepage.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: too sandy, seepage.
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
362, 363 Haig	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
364B Grundy	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
424D*, 424D2*:					
Lindley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Keswick	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
424E*, 424E2*:					
Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Keswick	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
425D, 425D2 Keswick	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
452D2 Lineville	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
453 Tuskeego	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
478G*:					
Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
Rock outcrop.					
484 Lawson	Severe: flooding, wetness.	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
499D Nordness	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
499F Nordness	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
520 Coppock	Severe: wetness, flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
570C, 570C2 Nira	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
571B Hedrick	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
571C2 Hedrick	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
594C2 Galland	Severe: wetness, percs slowly.	Severe: slope.	Severe: seepage, too clayey.	Slight	Poor: too clayey, hard to pack.
594D2 Galland	Severe: wetness, percs slowly.	Severe: slope.	Severe: seepage, too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
594E, 594E2 Galland	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: seepage, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
730B*:					
Nodaway	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Cantril	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
731C2 Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
732C2, 732D2 Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
764B Grundy	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
779 Kalona	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
792D2 Armstrong	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
795D2 Ashgrove	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
831C2 Pershing	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
832C2----------------- Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
876B------------------ Ladoga	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
876C2----------------- Ladoga	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
880B------------------ Clinton	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
880C, 880C2---------- Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey, hard to pack.
880D2----------------- Clinton	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
881B------------------ Otley	Moderate: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
881C2----------------- Otley	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
977, 977B------------ Richwood	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Fair: too clayey, thin layer.
993D2*:					
Gara-----------------	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Moderate: slope.	Fair: too clayey, slope.
Armstrong------------	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
1057------------------ Rushville	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1122------------------ Sperry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
1130------------------ Belinda	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1131B----------------- Pershing	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
1132B----------------- Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
1133------------------ Colo	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Poor: wetness, hard to pack.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1180B---------------- Keomah	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
1279----------------- Taintor	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
1280, 1280B---------- Mahaska	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
1315*:					
Klum-----------------	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Fair: wetness.
Perks----------------	Severe: flooding, poor filter.	Severe: flooding, seepage.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: too sandy, seepage.
Nodaway--------------	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
1362----------------- Haig	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1779----------------- Kalona	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
13B*:				
Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
23C, 23C2 Arispe	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
41B Sparta	Good	Probable	Improbable: too sandy.	Fair: too sandy.
51 Vesser	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
56B Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
58E Douds	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
58F Douds	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65E, 65E2 Lindley	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65F, 65G Lindley	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
75, 75B Givin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
76B, 76C, 76C2, 76D2 Ladoga	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
80B, 80C, 80C2, 80D, 80D2 Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
88 Nevin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
110B, 110C Lamont	Good	Probable	Improbable: too sandy.	Good.
122 Sperry	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
130 Belinda	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
131B, 131C Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
132B, 132C Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
133, 133B, 133+ Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
154E*:				
Ainsworth	Fair: slope, shrink-swell.	Probable	Improbable: too sandy.	Poor: slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
163B, 163C2 Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
173 Hoopeston	Fair: wetness.	Probable	Improbable: too sandy.	Fair: small stones, thin layer.
175 Dickinson	Good	Probable	Improbable: too sandy.	Good.
179E, 179E2 Gara	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
180, 180B Keomah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
192D2 Adair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
208 Klum	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
211 Edina	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
220 Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
222C, 222C2 Clarinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
223C2, 223D2 Rinda	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
260 Beckwith	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
263, 263B Okaw	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
264B, 264C2 Ainsworth	Fair: shrink-swell.	Probable	Improbable: too sandy.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
279: Taintor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
280, 280B: Mahaska	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
281B, 281C, 281C2: Otley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
293B*, 293C*:				
Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Lamont	Good	Probable	Improbable: too sandy.	Good.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
293E*:				
Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Fayette	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
293F*:				
Chelsea	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Lamont	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Fayette	Poor: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
315*:				
Klum	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Perks	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
362, 363: Haig	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
364B: Grundy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
424D*, 424D2*:				
Lindley	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
424E*, 424E2*:				
Lindley	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
425D, 425D2 Keswick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
452D2 Lineville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
453 Tuskeego	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
478G*:				
Nordness	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Rock outcrop.				
484 Lawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
499D Nordness	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
499F Nordness	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
520 Coppock	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
570C, 570C2 Nira	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
571B, 571C2 Hedrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
594C2, 594D2 Galland	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
594E, 594E2 Galland	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
730B*:				
Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Cantril	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
731C2 Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
732C2, 732D2---------- Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
764B------------------ Grundy	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
779------------------- Kalona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
792D2----------------- Armstrong	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
795D2----------------- Ashgrove	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
831C2----------------- Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
832C2----------------- Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
876B, 876C2----------- Ladoga	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
880B, 880C, 880C2, 880D2---------------- Clinton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
881B, 881C2----------- Otley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
977, 977B------------- Richwood	Good-----------------	Probable-------------	Improbable: too sandy.	Good.
993D2*:				
Gara------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Armstrong-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1057------------------ Rushville	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1122------------------ Sperry	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
1130------------------ Belinda	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1131B----------------- Pershing	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
1132B----------------- Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
1133 Colo	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1180B Keomah	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
1279 Taintor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
1280, 1280B Mahaska	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1315*:				
Klum	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Perks	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Nodaway	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
1362 Haig	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
1779 Kalona	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
5010*, 5030*. Pits				
5040*. Orthents				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition; it does not eliminate the need for onsite investigation]

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
13B*:					
Vesser	Moderate: seepage, slope.	Severe: wetness.	Frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness	Wetness.
23C, 23C2 Arispe	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
41B Sparta	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.
51 Vesser	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.
56B Cantril	Moderate: seepage, slope.	Moderate: wetness.	Frost action, slope.	Wetness	Favorable.
58E, 58F Douds	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, too sandy.	Slope.
65E, 65E2, 65F, 65G Lindley	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope.
75 Givin	Slight	Moderate: wetness, hard to pack.	Frost action	Wetness, erodes easily.	Erodes easily.
75B Givin	Moderate: slope.	Moderate: wetness, hard to pack.	Frost action, slope.	Wetness, erodes easily.	Erodes easily.
76B, 76C, 76C2 Ladoga	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
76D2 Ladoga	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
80B, 80C, 80C2 Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
80D, 80D2 Clinton	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
88 Nevin	Moderate: seepage.	Moderate: wetness.	Frost action	Erodes easily, wetness.	Erodes easily.
110B, 110C Lamont	Severe: seepage.	Moderate: thin layer.	Deep to water	Soil blowing	Favorable.
122 Sperry	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
130---------------- Belinda	Slight-------------	Severe: wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
131B, 131C-------- Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
132B, 132C-------- Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
133, 133B, 133+--- Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness----------	Wetness.
154E*:					
Ainsworth--------	Severe: slope.	Moderate: thin layer.	Deep to water----	Slope, erodes easily.	Slope, erodes easily.
Lamont-----------	Severe: slope, seepage.	Moderate: thin layer.	Deep to water----	Soil blowing, slope.	Slope.
163B, 163C2------- Fayette	Moderate: slope, seepage.	Slight------------	Deep to water----	Favorable--------	Erodes easily.
173--------------- Hoopeston	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness.
175--------------- Dickinson	Severe: seepage.	Severe: seepage.	Deep to water----	Soil blowing, too sandy.	Favorable.
179E, 179E2------- Gara	Severe: slope.	Slight------------	Deep to water----	Slope------------	Slope.
180--------------- Keomah	Slight------------	Severe: hard to pack.	Frost action, percs slowly.	Wetness, erodes easily, percs slowly.	Erodes easily, percs slowly.
180B-------------- Keomah	Moderate: slope.	Severe: hard to pack.	Slope, frost action, percs slowly.	Wetness, erodes easily, percs slowly.	Erodes easily, percs slowly.
192D2------------- Adair	Severe: slope.	Moderate: wetness.	Percs slowly, slope, frost action.	Slope, wetness.	Wetness, slope.
208--------------- Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water----	Not needed-------	Not needed.
211--------------- Edina	Slight------------	Severe: hard to pack, wetness.	Percs slowly-----	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
220--------------- Nodaway	Moderate: seepage.	Severe: piping.	Deep to water----	Erodes easily----	Erodes easily.
222C, 222C2------- Clarinda	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
223C2------------- Rinda	Moderate: slope.	Severe: hard to pack.	Slope, percs slowly, frost action.	Erodes easily, wetness.	Erodes easily, wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
223D2: Rinda	Severe: slope.	Severe: hard to pack.	Slope, percs slowly, frost action.	Slope, wetness, erodes easily.	Wetness, slope, erodes easily.
260: Beckwith	Slight	Severe: wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
263: Okaw	Slight	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
263B: Okaw	Moderate: slope.	Severe: hard to pack, wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
264B, 264C2: Ainsworth	Moderate: seepage, slope.	Moderate: thin layer.	Deep to water	Erodes easily	Erodes easily.
279: Taintor	Moderate: seepage.	Severe: wetness.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
280: Mahaska	Moderate: seepage.	Moderate: wetness, hard to pack.	Frost action	Wetness, erodes easily.	Erodes easily.
280B: Mahaska	Moderate: seepage, slope.	Moderate: wetness, hard to pack.	Frost action, slope.	Wetness, erodes easily.	Erodes easily.
281B, 281C, 281C2: Otley	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
293B*, 293C*:					
Chelsea	Severe: seepage.	Severe: piping, seepage.	Deep to water	Too sandy, soil blowing.	Droughty.
Lamont	Severe: seepage.	Moderate: thin layer.	Deep to water	Soil blowing	Favorable.
Fayette	Moderate: slope, seepage.	Slight	Deep to water	Favorable	Erodes easily.
293E*, 293F*:					
Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Lamont	Severe: slope, seepage.	Moderate: thin layer.	Deep to water	Soil blowing, slope.	Slope.
Fayette	Severe: slope.	Slight	Deep to water	Slope	Slope, erodes easily.
315*:					
Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Not needed	Not needed.
Perks	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
315*:					
Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
362, 363 Haig	Slight	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
364B Grundy	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
424D*, 424D2*, 424E*, 424E2*:					
Lindley	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope.
Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
425D, 425D2 Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
452D2 Lineville	Severe: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
453 Tuskeego	Slight	Severe: thin layer, wetness.	Percs slowly	Wetness, percs slowly.	Wetness, percs slowly.
478G*:					
Nordness	Severe: slope, depth to rock.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Rock outcrop.					
484 Lawson	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
499D, 499F Nordness	Severe: slope, depth to rock.	Severe: thin layer.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
520 Coppock	Moderate: seepage.	Severe: hard to pack, wetness.	Flooding, frost action.	Wetness, erodes easily.	Wetness, erodes easily.
570C, 570C2 Nira	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
571B, 571C2 Hedrick	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
594C2 Galland	Moderate: seepage, slope.	Moderate: hard to pack, thin layer.	Deep to water	Erodes easily, percs slowly.	Erodes easily, rooting depth.
594D2, 594E, 594E2 Galland	Severe: slope.	Moderate: hard to pack, thin layer.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
730B*:					
Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
Cantril	Moderate: seepage, slope.	Moderate: wetness.	Frost action, slope.	Wetness	Favorable.
731C2 Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
732C2 Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
732D2 Weller	Severe: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Slope, wetness, erodes easily.	Slope, percs slowly, erodes easily.
764B Grundy	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily.
779 Kalona	Slight	Severe: wetness.	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
792D2 Armstrong	Severe: slope.	Moderate: wetness, hard to pack.	Percs slowly, frost action, slope.	Slope, percs slowly, wetness.	Percs slowly, slope, wetness.
795D2 Ashgrove	Severe: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
831C2 Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
832C2 Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
876B, 876C2 Ladoga	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
880B, 880C, 880C2 Clinton	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
880D2 Clinton	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
881B, 881C2 Otley	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Erodes easily	Erodes easily.
977 Richwood	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
977B Richwood	Moderate: slope, seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
993D2*:					
Gara	Severe: slope.	Slight	Deep to water	Slope	Slope.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Map symbol and soil name	Limitations for--		Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Terraces and diversions	Grassed waterways
993D2*:					
Armstrong	Severe: slope.	Moderate: wetness, hard to pack.	Percs slowly, frost action, slope.	Slope, percs slowly, wetness.	Percs slowly, slope, wetness.
1057 Rushville	Slight	Severe: hard to pack, wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1122 Sperry	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
1130 Belinda	Slight	Severe: wetness.	Percs slowly	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1131B Pershing	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Wetness, erodes easily.	Erodes easily, percs slowly.
1132B Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, erodes easily.	Percs slowly, erodes easily.
1133 Colo	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness	Wetness.
1180B Keomah	Moderate: slope.	Severe: hard to pack.	Slope, frost action, percs slowly.	Wetness, erodes easily, percs slowly.	Erodes easily, percs slowly.
1279 Taintor	Moderate: seepage.	Severe: wetness.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
1280 Mahaska	Moderate: seepage.	Moderate: wetness, hard to pack.	Frost action	Wetness, erodes easily.	Erodes easily.
1280B Mahaska	Moderate: seepage, slope.	Moderate: wetness, hard to pack.	Frost action, slope.	Wetness, erodes easily.	Erodes easily.
1315*:					
Klum	Severe: seepage.	Severe: seepage, piping.	Deep to water	Not needed	Not needed.
Perks	Severe: seepage.	Severe: seepage, piping.	Deep to water	Too sandy, soil blowing.	Droughty.
Nodaway	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily.
1362 Haig	Slight	Severe: wetness.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1779 Kalona	Slight	Severe: wetness.	Frost action	Wetness, erodes easily.	Wetness, erodes easily.
5010*, 5030*. Pits					
5040*. Orthents					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
13B*:											
Vesser----------	0-17	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	17-32	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	32-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	41-50	15-24
Colo------------	0-12	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-60	15-30
	12-42	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-55	20-30
	42-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	41-55	15-29
23C, 23C2-------- Arispe	0-9	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	9-41	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-60	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
41B-------------- Sparta	0-13	Loamy fine sand	SM	A-2, A-4	0	85-100	85-100	50-95	15-50	---	NP
	13-39	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	85-100	85-100	50-95	5-50	---	NP
	39-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	85-100	85-100	50-95	2-30	---	NP
51--------------- Vesser	0-17	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	17-32	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	32-60	Silty clay loam	CL	A-7	0	100	100	98-100	95-100	41-50	15-24
56B-------------- Cantril	0-16	Loam-------------	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	16-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
58E, 58F--------- Douds	0-14	Loam-------------	CL	A-6	0	95-100	85-100	70-90	60-80	25-35	11-20
	14-31	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	90-100	85-100	70-80	35-60	30-45	15-25
	31-60	Stratified loamy sand to clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6, A-2	0	90-100	85-100	65-85	20-60	15-35	5-15
65E, 65E2, 65F, 65G------------- Lindley	0-9	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	11-16
	9-45	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	45-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	11-15
75, 75B---------- Givin	0-11	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	11-52	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	45-60	25-35
	52-60	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
76B, 76C, 76C2, 76D2------------ Ladoga	0-12	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	12-40	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-20
80B, 80C, 80C2, 80D, 80D2------- Clinton	0-14	Silt loam--------	ML	A-4	0	100	100	100	95-100	30-40	5-10
	14-40	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
88--------------- Nevin	0-18	Silty clay loam	CL, OL	A-6, A-7	0	100	100	100	90-95	35-45	11-20
	18-52	Silty clay loam	CL	A-7	0	100	100	95-100	90-95	41-50	20-29
	52-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	95-100	90-95	41-50	20-29

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
110B, 110C-------- Lamont	0-8	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-13	Fine sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	13-40	Fine sandy loam, loam, sandy clay loam.	SM-SC, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	40-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
122--------------- Sperry	0-11	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	11-18	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	18-46	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	46-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	20-29
130--------------- Belinda	0-9	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	9-18	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	100	95-100	25-35	5-10
	18-38	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	38-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
131B, 131C-------- Pershing	0-12	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	12-16	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-29
	16-33	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	41-65	20-40
	33-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
132B, 132C-------- Weller	0-12	Silt loam--------	ML, CL, ML-CL	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	12-36	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	41-55	20-30
133, 133B--------- Colo	0-12	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-60	15-30
	12-42	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-55	20-30
	42-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	41-55	15-30
133+-------------- Colo	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	25-40	5-15
	12-42	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-55	20-30
	42-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	41-55	15-29
154E*:											
Ainsworth--------	0-12	Silt loam--------	ML	A-4	0	100	100	100	90-95	30-40	5-10
	12-44	Silty clay loam	CL, CH	A-7	0	100	100	95-100	80-95	41-55	20-34
	44-54	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	11-24
	54-60	Sandy loam, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	95-100	90-100	60-85	5-35	<20	NP
Lamont-----------	0-8	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-13	Fine sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	13-40	Fine sandy loam, loam, sandy clay loam.	SM-SC, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	40-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
163B, 163C2------- Fayette	0-12	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	12-52	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
173--------------- Hoopeston	0-17	Fine sandy loam	SM	A-2, A-4	0	90-100	90-100	70-90	25-45	20-35	NP-10
	17-27	Sandy loam, fine sandy loam.	SM, SC, SM-SC	A-2, A-4	0	90-100	90-100	60-85	25-50	<30	NP-10
	27-60	Loamy sand, sand, fine sand.	SP-SM, SM, SC	A-2, A-3	0	90-100	90-100	50-80	5-20	<25	NP-10
175--------------- Dickinson	0-10	Fine sandy loam	SM, SC, SM-SC	A-4, A-2	0	100	100	85-95	30-50	15-30	NP-10
	10-34	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-4	0	100	100	85-95	35-50	15-30	NP-10
	34-45	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SM-SC	A-2, A-3	0	100	100	80-95	5-20	<20	NP-5
	45-60	Sand, loamy fine sand, loamy sand.	SM, SP-SM	A-3, A-2	0	100	100	70-90	5-20	---	NP
179E, 179E2------ Gara	0-12	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	12-49	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	49-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
180, 180B-------- Keomah	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	15-41	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-60	30-45
	41-60	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
192D2------------ Adair	0-8	Loam-------------	CL, CL-ML	A-6, A-4	0	95-100	95-100	90-100	85-100	20-35	5-15
	8-38	Silty clay, clay, clay loam.	CL, CH	A-7	0	95-100	80-95	70-90	55-80	41-55	20-30
	38-60	Clay loam--------	CL	A-6, A-7	0	95-100	80-95	70-90	55-80	35-50	15-25
208-------------- Klum	0-16	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	16-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
211-------------- Edina	0-17	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-15
	17-41	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	55-75	30-45
	41-60	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	90-100	35-60	15-35
220-------------- Nodaway	0-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
222C, 222C2------ Clarinda	0-11	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	41-50	20-29
	11-36	Silty clay, clay	CH	A-7	0	100	95-100	85-100	80-100	55-70	30-40
	36-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
223C2, 223D2----- Rinda	0-8	Silty clay loam	CL	A-7	0	100	95-100	90-100	85-100	41-50	20-29
	8-60	Clay, silty clay	CH	A-7	0	95-100	95-100	80-95	75-90	55-70	35-45
260-------------- Beckwith	0-8	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	100	95-100	25-35	5-10
	8-15	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	15-37	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	37-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
263, 263B-------- Okaw	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	18-48	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	95-100	80-100	45-65	20-40
	48-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	100	100	95-100	80-100	45-65	20-34
264B, 264C2------ Ainsworth	0-12	Silt loam--------	ML	A-4	0	100	100	100	90-95	30-40	5-10
	12-44	Silty clay loam	CL, CH	A-7	0	100	100	95-100	80-95	41-55	20-35
	44-54	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	80-95	30-45	11-24
	54-60	Sandy loam, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	95-100	90-100	60-85	5-35	<20	NP

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
279----------------- Taintor	0-15	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-60	20-30
	15-39	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	39-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	15-24
280, 280B--------- Mahaska	0-10	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	10-45	Silty clay loam, silty clay.	CH, MH	A-7	0	100	100	100	95-100	50-60	20-30
	45-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-20
281B, 281C, 281C2------------ Otley	0-17	Silty clay loam	CL	A-7	0	100	100	100	95-100	41-50	15-24
	17-35	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	20-30
293B*, 293C*, 293E*, 293F*:											
Chelsea---------	0-8	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	8-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
Lamont----------	0-8	Fine sandy loam	SM-SC, SC	A-2, A-4	0	100	100	80-95	25-50	15-25	5-10
	8-13	Fine sandy loam, loamy fine sand.	SM, SM-SC	A-2, A-4	0	100	100	80-95	15-50	<25	NP-5
	13-40	Fine sandy loam, loam, sandy clay loam.	SM-SC, SC	A-2, A-4	0	100	100	85-95	30-50	20-30	5-10
	40-60	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2, A-3	0	100	100	70-90	5-25	---	NP
Fayette---------	0-12	Silt loam---------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	12-52	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	52-60	Silt loam---------	CL	A-6	0	100	100	100	95-100	30-40	11-20
315*:											
Klum-------------	0-16	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	16-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
Perks------------	0-6	Loamy sand--------	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
	6-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
Nodaway----------	0-60	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
362--------------- Haig	0-9	Silt loam---------	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	9-17	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	17-33	Silty clay--------	CH	A-7	0	100	100	100	95-100	50-65	30-40
	33-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	20-30
363--------------- Haig	0-10	Silty clay loam	CL, CH, ML, MH	A-7	0	100	100	100	95-100	41-55	15-25
	10-17	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	17-33	Silty clay--------	CH	A-7	0	100	100	100	95-100	50-65	30-40
	33-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	20-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
364B-------------- Grundy	0-10	Silt loam--------	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	11-20
	10-16	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-55	25-35
	16-36	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-70	30-45
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	90-100	90-100	41-55	25-35
424D*, 424D2*, 424E*, 424E2*:											
Lindley--------	0-9	Loam-------------	CL	A-6	0	95-100	90-100	85-95	50-65	25-35	11-16
	9-45	Clay loam, loam	CL	A-6, A-7	0	95-100	90-100	85-95	55-75	30-45	12-20
	45-60	Loam, clay loam	CL	A-6	0	95-100	90-100	85-95	50-70	25-35	11-16
Keswick--------	0-5	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	5-38	Clay loam, clay	CH, MH	A-7	0-5	90-100	80-100	70-90	55-80	50-60	20-30
	38-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D, 425D2------ Keswick	0-5	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	5-38	Clay loam, clay	CH, MH	A-7	0-5	90-100	80-100	70-90	55-80	50-60	20-30
	38-60	Clay loam--------	CL	A-6	0-5	90-100	80-100	70-90	55-80	30-40	15-25
452D2------------ Lineville	0-7	Silt loam--------	CL, ML	A-6, A-7	0	100	100	95-100	95-100	35-45	11-20
	7-23	Silty clay loam	CL, CH	A-7	0	100	100	95-100	95-100	45-55	25-35
	23-40	Clay loam, loam	CL	A-6, A-7	0	95-100	80-100	75-95	65-90	35-50	20-35
	40-60	Clay loam, clay	CH, CL	A-7	0-5	95-100	80-100	70-90	55-80	45-60	25-35
453-------------- Tuskeego	0-17	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	98-100	95-100	25-35	5-15
	17-51	Silty clay loam, silty clay.	CH	A-7	0	100	100	98-100	95-100	50-60	25-35
	51-60	Silty clay loam	CH, CL, ML, MH	A-7	0	100	100	98-100	95-100	45-55	25-35
478G*:											
Nordness--------	0-5	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	5-15	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	90-100	70-90	35-45	15-25
	15	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
484-------------- Lawson	0-30	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	80-100	20-30	5-10
	30-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	90-100	80-100	20-40	11-25
499D, 499F------- Nordness	0-5	Silt loam--------	CL, CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	5-15	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	90-100	70-90	35-45	15-25
	15	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
520-------------- Coppock	0-8	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	8-25	Silt loam--------	CL	A-6	0	100	100	98-100	95-100	30-40	11-20
	25-60	Silty clay loam, silt loam.	CL, CH, MH	A-6, A-7	0	100	100	98-100	95-100	35-55	15-25
570C, 570C2------ Nira	0-13	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-25
	13-47	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	47-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
571B, 571C2------ Hedrick	0-8	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	8-50	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	50-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
594C2, 594D2, 594E, 594E2----- Galland	0-8	Loam-------------	CL	A-6	0	90-100	80-100	75-100	65-90	30-40	11-20
	8-38	Clay loam, clay, silty clay.	CL, CH	A-7	0-5	90-100	80-100	75-100	65-80	41-55	25-35
	38-60	Stratified sandy loam to clay.	SM-SC, SC, CL-ML, CL	A-4, A-2, A-6	0-5	90-100	80-100	65-95	30-60	20-35	5-15
730B*:											
Nodaway---------	0-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
Cantril---------	0-16	Loam-------------	CL	A-6	0	100	100	85-95	65-75	30-40	11-20
	16-60	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-88	35-45	15-25
731C2------------ Pershing	0-7	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-29
	7-16	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-29
	16-33	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	41-65	20-40
	33-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
732C2, 732D2----- Weller	0-6	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	6-36	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	41-55	20-30
764B------------- Grundy	0-10	Silt loam--------	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	11-20
	10-16	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-55	25-35
	16-36	Silty clay, silty clay loam.	CH	A-7	0	100	100	95-100	90-100	50-70	30-45
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	90-100	90-100	41-55	25-35
779-------------- Kalona	0-17	Silty clay loam	MH	A-7	0	100	100	100	95-100	50-65	20-30
	17-35	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	15-24
792D2------------ Armstrong	0-8	Clay loam--------	CL	A-6, A-7	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	8-48	Clay loam, clay, silty clay loam.	CL, CH	A-7	0-5	90-100	80-95	70-90	55-80	45-60	20-30
	48-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
795D2------------ Ashgrove	0-5	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-25
	5-14	Silty clay, silty clay loam.	CH	A-7	0	100	95-100	85-100	85-100	55-70	30-40
	14-60	Clay, silty clay	CH	A-7	0	95-100	95-100	75-90	75-90	50-60	25-35
831C2------------ Pershing	0-7	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-30
	7-16	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-30
	16-33	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	41-65	20-40
	33-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
832C2------------ Weller	0-6	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	6-36	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	41-55	20-30
876B, 876C2------ Ladoga	0-12	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	12-40	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	100	95-100	30-40	15-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
880B, 880C, 880C2, 880D2----Clinton	0-14	Silty loam-------	ML	A-4	0	100	100	100	95-100	30-40	5-10
	14-40	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
881B, 881C2------Otley	0-17	Silty clay loam	CL	A-7	0	100	100	100	95-100	41-50	15-24
	17-35	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	20-30
977, 977B--------Richwood	0-16	Silt loam--------	ML	A-4	0	100	100	90-100	85-95	25-35	3-10
	16-44	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	85-95	20-35	5-15
	44-60	Stratified silt loam to loamy sand.	CL, ML, SC, SM	A-4	0	100	100	85-95	36-75	<25	2-10
993D2*:											
Gara------------	0-7	Loam-------------	CL, CL-ML	A-4, A-6	0	95-100	85-95	75-85	55-70	20-30	5-15
	7-49	Clay loam, loam	CL	A-6	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	49-60	Loam, clay loam	CL	A-6, A-7	0-5	90-95	85-95	70-85	55-75	35-45	15-25
Armstrong-------	0-8	Loam-------------	CL, CL-ML	A-6, A-4	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	8-48	Clay loam, clay, silty clay loam.	CL, CH	A-7	0-5	90-100	80-95	70-90	55-80	45-60	20-30
	48-60	Clay loam--------	CL	A-6	0-5	90-100	80-95	70-90	55-80	30-40	15-20
1057-------------Rushville	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	7-16	Silt loam, silt	ML, CL	A-4, A-6	0	100	100	95-100	95-100	20-40	NP-15
	16-53	Silty clay loam, silty clay.	ML, CH	A-7	0	100	100	95-100	95-100	45-60	15-30
	53-60	Silt loam, silty clay loam.	CL	A-4, A-6, A-7	0	100	100	95-100	90-100	30-45	8-20
1122-------------Sperry	0-11	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	11-18	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	18-46	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	46-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	20-29
1130-------------Belinda	0-9	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	5-15
	9-18	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	100	95-100	25-35	5-10
	18-38	Silty clay-------	CH	A-7	0	100	100	100	95-100	55-70	30-40
	38-60	Silty clay loam	CH	A-7	0	100	100	100	95-100	50-65	25-35
1131B------------Pershing	0-12	Silt loam--------	CL	A-6	0	100	100	100	95-100	30-40	11-20
	12-16	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	41-55	15-29
	16-33	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	41-65	20-40
	33-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	100	100	100	95-100	35-55	20-35
1132B------------Weller	0-12	Silt loam--------	ML, CL, ML-CL	A-6, A-4	0	100	100	100	95-100	25-40	5-15
	12-36	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	41-55	20-30
1133-------------Colo	0-12	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-60	15-30
	12-42	Silty clay loam	CL, CH	A-7	0	100	100	90-100	90-100	41-55	20-30
	42-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	80-100	41-55	15-29

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1180B------------ Keomah	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	15-41	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	100	95-100	45-60	30-45
	41-60	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	20-30
1279------------- Taintor	0-15	Silty clay loam	CL, CH	A-7	0	100	100	100	95-100	45-60	20-30
	15-39	Silty clay, silty clay loam.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	39-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	15-24
1280, 1280B------ Mahaska	0-10	Silty clay loam	CL	A-7, A-6	0	100	100	100	95-100	35-50	15-25
	10-45	Silty clay loam, silty clay.	CH, MH	A-7	0	100	100	100	95-100	50-60	20-30
	45-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	35-45	15-20
1315*:											
Klum------------	0-16	Fine sandy loam	SM, ML, SC, CL	A-4	0	100	95-100	70-90	40-55	20-35	3-10
	16-60	Stratified silt loam to sandy loam.	SM, ML, SC, CL	A-4, A-2	0	100	95-100	70-95	10-70	<30	NP-10
Perks-----------	0-6	Loamy sand-------	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
	6-60	Sand, loamy sand	SM, SP, SP-SM	A-1	0	90-100	90-95	30-50	3-20	---	NP
Nodaway---------	0-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	95-100	95-100	90-100	25-35	5-15
1362------------- Haig	0-9	Silt loam--------	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	9-17	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	100	95-100	41-55	20-30
	17-33	Silty clay-------	CH	A-7	0	100	100	100	95-100	50-65	30-40
	33-60	Silty clay loam	CL, CH	A-7, A-6	0	100	100	100	95-100	35-55	20-30
1779------------- Kalona	0-17	Silty clay loam	MH	A-7	0	100	100	100	95-100	50-65	20-30
	17-35	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	95-100	41-50	15-24
5010*, 5030*. Pits											
5040*. Orthents											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	g/cm3	In/hr	In/in	pH				
13B*:										
Vesser----------	0-17	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	5	6
	17-32	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.43		
	32-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.6-6.5	Moderate-----	0.43		
Colo------------	0-12	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.28	5	7
	12-42	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	High---------	0.28		
	42-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High---------	0.28		
23C, 23C2-------- Arispe	0-9	28-35	1.35-1.40	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.32	5	7
	9-41	35-42	1.35-1.45	0.2-0.6	0.18-0.20	5.1-7.3	High---------	0.43		
	41-60	24-35	1.40-1.50	0.6-2.0	0.18-0.20	6.6-7.3	High---------	0.43		
41B-------------- Sparta	0-13	3-10	1.20-1.40	2.0-6.0	0.09-0.12	5.1-7.3	Low----------	0.17	5	2
	13-39	1-8	1.40-1.60	6.0-20	0.05-0.11	5.1-6.5	Low----------	0.17		
	39-60	0-5	1.50-1.70	6.0-20	0.04-0.07	5.1-6.0	Low----------	0.17		
51--------------- Vesser	0-17	20-26	1.30-1.35	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	5	6
	17-32	18-22	1.35-1.40	0.6-2.0	0.18-0.22	5.1-6.0	Moderate-----	0.43		
	32-60	30-35	1.40-1.45	0.6-2.0	0.17-0.21	5.1-6.5	Moderate-----	0.43		
56B-------------- Cantril	0-16	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.32	5	6
	16-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate-----	0.32		
58E, 58F--------- Douds	0-14	20-27	1.45-1.50	0.6-2.0	0.15-0.17	5.1-7.3	Low----------	0.32	5-4	6
	14-31	26-35	1.45-1.65	0.6-2.0	0.15-0.17	4.5-6.0	Moderate-----	0.32		
	31-60	5-30	1.55-1.75	0.6-6.0	0.11-0.13	5.1-6.0	Low----------	0.32		
65E, 65E2, 65F, 65G------------- Lindley	0-9	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low----------	0.32	5	6
	9-45	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	45-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
75, 75B---------- Givin	0-11	18-26	1.30-1.40	0.6-2.0	0.22-0.24	5.6-6.0	Moderate-----	0.32	5	6
	11-52	36-42	1.30-1.45	0.2-0.6	0.18-0.20	5.1-5.5	Moderate-----	0.43		
	52-60	27-34	1.40-1.50	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.43		
76B, 76C, 76C2, 76D2------------ Ladoga	0-12	18-35	1.30-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	6
	12-40	36-42	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	40-60	24-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
80B, 80C, 80C2, 80D, 80D2------- Clinton	0-14	16-26	1.30-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	14-40	36-42	1.35-1.45	0.2-0.6	0.16-0.20	4.5-6.0	Moderate-----	0.37		
	40-60	24-35	1.40-1.55	0.6-2.0	0.18-0.20	6.1-6.5	Moderate-----	0.37		
88--------------- Nevin	0-18	26-29	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7
	18-52	30-35	1.30-1.40	0.6-2.0	0.18-0.20	6.1-6.5	Moderate-----	0.43		
	52-60	25-36	1.40-1.45	0.6-2.0	0.18-0.20	6.6-7.3	Moderate-----	0.43		
110B, 110C------- Lamont	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low----------	0.24	5	3
	8-13	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	13-40	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-6.0	Low----------	0.24		
	40-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low----------	0.17		
122-------------- Sperry	0-11	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6
	11-18	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28		
	18-46	38-45	1.40-1.45	0.06-0.2	0.14-0.16	5.1-6.5	High---------	0.43		
	46-60	26-34	1.45-1.50	0.2-0.6	0.19-0.21	5.6-6.5	High---------	0.43		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	g/cm3	In/hr	In/in	pH				
130------------- Belinda	0-9	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	4	6
	9-18	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-6.0	Low-----------	0.37		
	18-38	42-52	1.30-1.45	<0.06	0.12-0.14	4.5-5.5	High----------	0.28		
	38-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High----------	0.28		
131B, 131C-------- Pershing	0-12	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	3	6
	12-16	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate------	0.37		
	16-33	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High----------	0.37		
	33-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High----------	0.37		
132B, 132C-------- Weller	0-12	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6
	12-36	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43		
	36-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High----------	0.43		
133, 133B--------- Colo	0-12	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High----------	0.28	5	7
	12-42	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	High----------	0.28		
	42-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High----------	0.28		
133+-------------- Colo	0-12	20-26	1.25-1.30	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.28	5	6
	12-42	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	High----------	0.28		
	42-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High----------	0.28		
154E*:										
Ainsworth--------	0-12	18-26	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.37	5	6
	12-44	32-40	1.35-1.45	0.2-0.6	0.16-0.20	4.5-6.5	Moderate------	0.37		
	44-54	22-34	1.40-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate------	0.37		
	54-60	4-12	1.55-1.65	6.0-20	0.05-0.07	4.5-7.3	Low-----------	0.17		
Lamont-----------	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low-----------	0.24	5	3
	8-13	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low-----------	0.24		
	13-40	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-6.0	Low-----------	0.24		
	40-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low-----------	0.17		
163B, 163C2------- Fayette	0-12	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37	5	6
	12-52	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37		
	52-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate------	0.37		
173--------------- Hoopeston	0-17	8-18	1.35-1.70	2.0-6.0	0.12-0.15	5.1-6.5	Low-----------	0.20	4	3
	17-27	12-18	1.45-1.75	2.0-6.0	0.12-0.17	5.1-7.8	Low-----------	0.28		
	27-60	2-10	1.50-1.80	6.0-20	0.05-0.10	4.5-8.4	Low-----------	0.17		
175--------------- Dickinson	0-10	10-18	1.50-1.55	2.0-6.0	0.12-0.15	5.6-7.3	Low-----------	0.20	4	3
	10-34	10-15	1.45-1.55	2.0-6.0	0.12-0.15	5.1-6.5	Low-----------	0.20		
	34-45	4-10	1.55-1.65	6.0-20	0.08-0.10	5.1-6.5	Low-----------	0.20		
	45-60	4-10	1.60-1.70	6.0-20	0.02-0.04	5.6-6.5	Low-----------	0.15		
179E, 179E2------- Gara	0-12	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate------	0.28	5	6
	12-49	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate------	0.28		
	49-60	24-38	1.75-1.85	0.2-0.6	0.16-0.18	6.6-8.4	Moderate------	0.37		
180, 180B--------- Keomah	0-15	16-22	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	6
	15-41	27-42	1.30-1.45	0.06-0.6	0.18-0.20	4.5-5.5	High----------	0.37		
	41-60	27-38	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.5	Moderate------	0.37		
192D2------------- Adair	0-8	24-27	1.45-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Moderate------	0.32	3	6
	8-38	38-50	1.50-1.60	0.06-0.2	0.13-0.16	5.1-6.5	High----------	0.32		
	38-60	30-38	1.60-1.85	0.2-0.6	0.14-0.16	5.6-7.8	Moderate------	0.32		
208--------------- Klum	0-16	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low-----------	0.20	5	3
	16-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low-----------	0.20		
211--------------- Edina	0-17	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Moderate------	0.37	4	6
	17-41	45-60	1.30-1.45	<0.2	0.11-0.13	5.6-7.3	Very high-----	0.37		
	41-60	27-40	1.35-1.50	0.06-0.2	0.18-0.20	6.6-7.3	High----------	0.37		
220--------------- Nodaway	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate------	0.37	5	6

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	g/cm3	In/hr	In/in	pH				
222C, 222C2------ Clarinda	0-11	30-38	1.45-1.50	0.2-0.6	0.17-0.19	5.1-7.3	Moderate-----	0.37	3	7
	11-36	40-60	1.45-1.60	<0.06	0.14-0.16	5.1-6.5	High---------	0.37		
	36-60	40-60	1.55-1.75	<0.06	0.14-0.16	5.6-7.3	High---------	0.37		
223C2, 223D2----- Rinda	0-8	27-35	1.45-1.50	0.2-0.6	0.20-0.22	5.6-7.3	Moderate-----	0.43	2	6
	8-60	40-60	1.45-1.75	<0.06	0.14-0.16	5.1-7.3	High---------	0.32		
260-------------- Beckwith	0-8	16-22	1.35-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	4	6
	8-15	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.37		
	15-37	40-52	1.30-1.45	<0.06	0.12-0.14	5.1-6.0	High---------	0.28		
	37-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.37		
263, 263B-------- Okaw	0-18	15-27	1.20-1.40	0.2-0.6	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
	18-48	35-60	1.45-1.70	<0.06	0.08-0.18	3.6-7.3	High---------	0.32		
	48-60	35-55	1.50-1.70	<0.06	0.08-0.20	3.6-8.4	High---------	0.32		
264B, 264C2------ Ainsworth	0-12	18-26	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.37	5	6
	12-44	32-40	1.35-1.45	0.2-0.6	0.16-0.20	4.5-6.5	Moderate-----	0.37		
	44-54	22-34	1.40-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.37		
	54-60	4-12	1.55-1.65	6.0-20	0.05-0.07	4.5-7.3	Low----------	0.17		
279-------------- Taintor	0-15	30-36	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	7
	15-39	35-44	1.30-1.45	0.2-0.6	0.14-0.18	5.6-6.5	High---------	0.43		
	39-60	24-34	1.40-1.50	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
280, 280B-------- Mahaska	0-10	20-32	1.30-1.40	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	6
	10-45	36-42	1.30-1.45	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.43		
	45-60	24-32	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
281B, 281C, 281C2----------- Otley	0-17	28-34	1.25-1.35	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	7
	17-35	36-42	1.30-1.40	0.6-2.0	0.18-0.20	5.1-5.5	Moderate-----	0.43		
	35-60	24-35	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
293B*, 293C*, 293E*, 293F*:										
Chelsea--------	0-8	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2
	8-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low----------	0.17		
Lamont---------	0-8	10-15	1.50-1.55	2.0-6.0	0.16-0.18	5.1-7.3	Low----------	0.24	5	3
	8-13	5-15	1.50-1.55	2.0-6.0	0.14-0.16	5.1-7.3	Low----------	0.24		
	13-40	10-22	1.45-1.65	2.0-6.0	0.14-0.16	5.1-6.0	Low----------	0.24		
	40-60	2-10	1.65-1.75	6.0-20	0.09-0.11	5.1-6.5	Low----------	0.17		
Fayette--------	0-12	15-25	1.30-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	12-52	25-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37		
	52-60	22-26	1.45-1.50	0.6-2.0	0.18-0.20	5.1-7.8	Moderate-----	0.37		
315*:										
Klum------------	0-16	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low----------	0.20	5	3
	16-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low----------	0.20		
Perks-----------	0-6	2-10	1.50-1.55	6.0-20	0.07-0.09	5.6-6.5	Low----------	0.15	5	1
	6-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-6.5	Low----------	0.15		
Nodaway---------	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37	5	6
362-------------- Haig	0-9	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	5	6
	9-17	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	High---------	0.37		
	17-33	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-6.0	High---------	0.37		
	33-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High---------	0.37		
363-------------- Haig	0-10	32-40	1.35-1.40	0.6-2.0	0.21-0.23	5.6-7.3	High---------	0.37	5	7
	10-17	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	High---------	0.37		
	17-33	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-6.0	High---------	0.37		
	33-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High---------	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group
	In	Pct	g/cm3	In/hr	In/in	pH				
364B----------- Grundy	0-10	12-27	1.35-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	3	6
	10-16	32-45	1.35-1.45	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.37		
	16-36	40-50	1.30-1.40	0.06-0.2	0.11-0.13	5.1-7.3	High---------	0.37		
	36-60	28-35	1.35-1.40	0.06-0.2	0.18-0.20	5.6-7.3	High---------	0.37		
424D*, 424D2*, 424E*, 424E2*:										
Lindley--------	0-9	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low----------	0.32	5	6
	9-45	25-35	1.40-1.60	0.2-0.6	0.14-0.18	4.5-6.5	Moderate-----	0.32		
	45-60	18-32	1.45-1.65	0.2-0.6	0.12-0.16	6.1-7.8	Moderate-----	0.32		
Keswick--------	0-5	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate-----	0.37	3	6
	5-38	35-48	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High---------	0.37		
	38-60	30-40	1.60-1.80	0.2-0.6	0.12-0.16	4.5-6.0	Moderate-----	0.37		
425D, 425D2------ Keswick	0-5	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate-----	0.37	3	6
	5-38	35-48	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High---------	0.37		
	38-60	30-40	1.60-1.80	0.2-0.6	0.12-0.16	4.5-6.0	Moderate-----	0.37		
452D2----------- Lineville	0-7	22-27	1.45-1.50	0.6-2.0	0.16-0.20	5.1-7.3	Moderate-----	0.37	3	6
	7-23	28-35	1.50-1.55	0.2-0.6	0.17-0.21	5.1-6.0	Moderate-----	0.37		
	23-40	20-35	1.65-1.75	0.06-0.2	0.17-0.21	5.6-6.0	Moderate-----	0.37		
	40-60	28-45	1.75-1.85	0.06-0.2	0.13-0.21	5.6-7.3	High---------	0.37		
453------------- Tuskeego	0-17	16-22	1.35-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Moderate-----	0.32	3	5
	17-51	32-48	1.30-1.45	<0.06	0.13-0.17	5.1-6.0	High---------	0.32		
	51-60	28-40	1.40-1.50	0.06-0.2	0.16-0.19	5.6-6.5	Moderate-----	0.32		
478G*:										
Nordness---------	0-5	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43	2	6
	5-15	22-29	1.35-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.43		
	15	---	---	---	---	---	-------------	----		
Rock outcrop.										
484------------- Lawson	0-30	10-20	1.20-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low----------	0.28	5	5
	30-60	18-30	1.55-1.65	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.43		
499D, 499F------- Nordness	0-5	18-24	1.30-1.35	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.43	2	6
	5-15	22-29	1.35-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.43		
	15	---	---	---	---	---	-------------	----		
520------------- Coppock	0-8	16-26	1.30-1.35	0.6-2.0	0.20-0.24	6.1-7.3	Moderate-----	0.32	5	6
	8-25	16-27	1.30-1.40	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.43		
	25-60	24-35	1.30-1.40	0.6-2.0	0.17-0.21	4.5-6.0	Moderate-----	0.43		
570C, 570C2------ Nira	0-13	28-34	1.25-1.40	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7
	13-47	30-38	1.25-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	47-60	24-34	1.35-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate-----	0.43		
571B, 571C2------ Hedrick	0-8	16-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Low----------	0.32	5	6
	8-50	27-37	1.30-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
	50-60	24-32	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.8	Moderate-----	0.43		
594C2, 594D2, 594E, 594E2----- Galland	0-8	22-35	1.45-1.50	0.6-2.0	0.19-0.21	5.6-7.3	Moderate-----	0.37	3	6
	8-38	35-48	1.45-1.75	0.06-0.2	0.14-0.19	5.1-6.0	High---------	0.37		
	38-60	10-45	1.55-1.75	0.6-6.0	0.11-0.13	6.1-6.5	Low----------	0.24		
730B*:										
Nodaway---------	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate-----	0.37	5	6
Cantril---------	0-16	14-27	1.40-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low----------	0.32	5	6
	16-60	27-35	1.45-1.75	0.6-2.0	0.14-0.16	5.1-6.5	Moderate-----	0.32		
731C2----------- Pershing	0-7	27-38	1.30-1.40	0.2-0.6	0.22-0.24	4.5-7.3	Moderate-----	0.37	3-2	7
	7-16	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	16-33	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.37		
	33-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.0	High---------	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	Pct	g/cm3	In/hr	In/in	pH				
732C2, 732D2-----Weller	0-6	27-36	1.35-1.45	0.2-0.6	0.22-0.24	4.5-7.3	High---------	0.43	2	7
	6-36	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.43		
	36-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High---------	0.43		
764B-------------Grundy	0-10	12-27	1.35-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.37	3	6
	10-16	32-45	1.35-1.45	0.2-0.6	0.18-0.20	5.6-6.5	High---------	0.37		
	16-36	40-50	1.30-1.40	0.06-0.2	0.11-0.13	5.1-7.3	High---------	0.37		
	36-60	28-35	1.35-1.40	0.06-0.2	0.18-0.20	5.6-7.3	High---------	0.37		
779--------------Kalona	0-17	36-39	1.35-1.40	0.2-0.6	0.18-0.20	5.6-7.3	High---------	0.28	5	7
	17-35	36-42	1.40-1.45	0.2-0.6	0.14-0.18	5.6-7.3	High---------	0.37		
	35-60	26-34	1.45-1.50	0.2-0.6	0.18-0.20	6.1-7.8	Moderate-----	0.37		
792D2------------Armstrong	0-8	27-38	1.45-1.50	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.32	2	6
	8-48	36-48	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	48-60	30-36	1.55-1.75	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
795D2------------Ashgrove	0-5	27-40	1.45-1.50	0.2-0.6	0.18-0.20	4.5-7.3	Moderate-----	0.43	2	7
	5-14	35-45	1.45-1.50	<0.06	0.12-0.14	4.5-6.5	High---------	0.32		
	14-60	40-60	1.45-1.75	<0.06	0.12-0.14	4.5-7.3	High---------	0.32		
831C2------------Pershing	0-7	27-38	1.30-1.40	0.2-0.6	0.22-0.24	4.5-7.3	Moderate-----	0.37	3	7
	7-16	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate-----	0.37		
	16-33	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High---------	0.37		
	33-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High---------	0.37		
832C2------------Weller	0-6	27-36	1.35-1.45	0.2-0.6	0.22-0.24	4.5-7.3	High---------	0.43	2	7
	6-36	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High---------	0.43		
	36-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High---------	0.43		
876B, 876C2------Ladoga	0-12	18-35	1.30-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Low----------	0.32	5	6
	12-40	36-42	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.43		
	40-60	24-32	1.35-1.45	0.6-2.0	0.18-0.20	5.1-6.5	Moderate-----	0.43		
880B, 880C, 880C2, 880D2----Clinton	0-14	16-26	1.30-1.40	0.6-2.0	0.20-0.22	5.1-7.3	Low----------	0.37	5	6
	14-40	36-42	1.35-1.45	0.2-0.6	0.16-0.20	4.5-6.0	Moderate-----	0.37		
	40-60	24-35	1.40-1.55	0.6-2.0	0.18-0.20	6.1-6.5	Moderate-----	0.37		
881B, 881C2------Otley	0-17	28-34	1.25-1.35	0.6-2.0	0.21-0.23	5.1-7.3	Moderate-----	0.32	5	7
	17-35	36-42	1.30-1.40	0.6-2.0	0.18-0.20	5.1-5.5	Moderate-----	0.43		
	35-60	24-35	1.35-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43		
977, 977B--------Richwood	0-16	15-22	1.35-1.60	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.28	5	5
	16-44	18-34	1.55-1.65	0.6-2.0	0.18-0.22	5.6-7.3	Moderate-----	0.43		
	44-60	10-20	1.55-1.65	0.6-6.0	0.10-0.22	5.6-7.3	Low----------	0.43		
993D2*:										
Gara------------	0-7	24-27	1.50-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	5	6
	7-49	25-38	1.55-1.75	0.2-0.6	0.16-0.18	4.5-6.5	Moderate-----	0.28		
	49-60	24-38	1.75-1.85	0.2-0.6	0.16-0.18	6.6-8.4	Moderate-----	0.37		
Armstrong--------	0-8	22-27	1.45-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.32	3	6
	8-48	36-48	1.45-1.55	0.06-0.2	0.11-0.16	4.5-6.5	High---------	0.32		
	48-60	30-36	1.55-1.75	0.2-0.6	0.14-0.16	5.1-7.3	Moderate-----	0.32		
1057-------------Rushville	0-7	15-27	1.25-1.45	0.2-0.6	0.22-0.24	4.5-7.3	Low----------	0.43	3	6
	7-16	10-22	1.30-1.50	0.06-0.2	0.15-0.20	4.5-6.5	Low----------	0.43		
	16-53	35-45	1.40-1.60	<0.2	0.11-0.20	4.5-7.8	High---------	0.43		
	53-60	18-30	1.40-1.55	0.06-0.2	0.16-0.21	5.6-8.4	Moderate-----	0.43		
1122-------------Sperry	0-11	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28	5	6
	11-18	18-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate-----	0.28		
	18-46	38-45	1.40-1.45	0.06-0.2	0.14-0.16	5.1-6.5	High---------	0.43		
	46-60	26-34	1.45-1.50	0.2-0.6	0.19-0.21	5.6-6.5	High---------	0.43		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
								K	T	
	In	Pct	g/cm3	In/hr	In/in	pH				
1130 Belinda	0-9	16-22	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	4	6
	9-18	18-27	1.30-1.35	0.6-2.0	0.20-0.22	4.5-6.0	Low	0.37		
	18-38	42-52	1.30-1.45	<0.06	0.12-0.14	4.5-5.5	High	0.28		
	38-60	28-40	1.40-1.50	0.06-0.6	0.18-0.20	5.1-6.0	High	0.28		
1131B Pershing	0-12	20-27	1.30-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	3-2	6
	12-16	27-35	1.30-1.40	0.2-0.6	0.20-0.22	5.1-6.0	Moderate	0.37		
	16-33	35-48	1.35-1.45	0.06-0.2	0.18-0.20	5.1-6.0	High	0.37		
	33-60	24-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.5	High	0.37		
1132B Weller	0-12	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	6
	12-36	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High	0.43		
	36-60	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High	0.43		
1133 Colo	0-12	27-32	1.28-1.32	0.6-2.0	0.21-0.23	5.6-7.3	High	0.28	5	7
	12-42	30-35	1.25-1.35	0.6-2.0	0.18-0.20	5.6-7.3	High	0.28		
	42-60	25-35	1.35-1.45	0.6-2.0	0.18-0.20	6.1-7.3	High	0.28		
1180B Keomah	0-15	16-22	1.30-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	6
	15-41	27-42	1.30-1.45	0.06-0.6	0.18-0.20	4.5-5.5	High	0.37		
	41-60	27-38	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.5	Moderate	0.37		
1279 Taintor	0-15	30-36	1.30-1.40	0.2-0.6	0.21-0.23	5.6-7.3	Moderate	0.28	5	7
	15-39	35-44	1.30-1.45	0.2-0.6	0.14-0.18	5.6-6.5	High	0.43		
	39-60	24-34	1.40-1.50	0.6-2.0	0.18-0.20	6.1-7.8	Moderate	0.43		
1280, 1280B Mahaska	0-10	20-32	1.30-1.40	0.6-2.0	0.21-0.23	5.1-7.3	Moderate	0.32	5	6
	10-45	36-42	1.30-1.45	0.6-2.0	0.14-0.18	4.5-6.0	Moderate	0.43		
	45-60	24-32	1.40-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.43		
1315*:										
Klum	0-16	5-18	1.50-1.60	2.0-6.0	0.15-0.18	6.1-7.3	Low	0.20	5	3
	16-60	5-18	1.50-1.60	2.0-6.0	0.13-0.18	6.1-7.3	Low	0.20		
Perks	0-6	2-10	1.50-1.55	6.0-20	0.07-0.09	5.6-6.5	Low	0.15	5	1
	6-60	2-10	1.50-1.75	6.0-20	0.02-0.04	5.6-6.5	Low	0.15		
Nodaway	0-60	18-28	1.25-1.35	0.6-2.0	0.20-0.23	6.1-7.3	Moderate	0.37	5	6
1362 Haig	0-9	22-27	1.35-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Moderate	0.37	5	6
	9-17	28-48	1.30-1.35	0.6-2.0	0.21-0.23	5.1-6.0	High	0.37		
	17-33	40-50	1.30-1.45	<0.2	0.12-0.14	5.1-6.0	High	0.37		
	33-60	28-40	1.40-1.50	0.2-0.6	0.18-0.20	6.1-7.3	High	0.37		
1779 Kalona	0-17	36-39	1.35-1.40	0.2-0.6	0.18-0.20	5.6-7.3	High	0.28	5	7
	17-35	36-42	1.40-1.45	0.2-0.6	0.14-0.18	5.6-7.3	High	0.37		
	35-60	26-34	1.45-1.50	0.2-0.6	0.18-0.20	6.1-7.8	Moderate	0.37		
5010*, 5030*. Pits										
5040*. Orthents										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
13B:												
Vesser	C	Rare	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
23C, 23C2 Arispe	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
41B Sparta	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Moderate.
51 Vesser	C	Occasional	Brief	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
56B Cantril	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
58E, 58F Douds	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Moderate	Moderate.
65E, 65E2, 65F, 65G Lindley	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
75, 75B Givin	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
76B, 76C, 76C2, 76D2 Ladoga	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
80B, 80C, 80C2, 80D, 80D2 Clinton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
88 Nevin	B	Rare	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Low.
110B, 110C Lamont	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
122* Sperry	C/D	None	---	---	+1-1.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
130 Belinda	D	None	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
131B, 131C Pershing	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
132B, 132C: Weller	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	High.
133, 133B, 133+: Colo	B/D	Occasional	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
154E:												
Ainsworth	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
Lamont	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
163B, 163C2: Fayette	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
173: Hoopeston	B	None	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High	Low	Moderate.
175: Dickinson	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
179E, 179E2: Gara	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
180, 180B: Keomah	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High	High	Moderate.
192D2: Adair	C	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
208: Klum	B	Frequent	Brief	Feb-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low	Low.
211: Edina	D	None	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
220: Nodaway	B	Occasional	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High	Moderate	Low.
222C, 222C2: Clarinda	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
223C2, 223D2: Rinda	D	None	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High	High	Moderate.
260: Beckwith	D	None	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High	Moderate.
263, 263B: Okaw	D	Rare	---	---	0-1.0	Apparent	Nov-Jul	>60	---	High	High	High.
264B, 264C2: Ainsworth	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
279---------------- Taintor	C/D	None---------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
280, 280B---------- Mahaska	B	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
281B, 281C, 281C2- Otley	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
293B, 293C, 293E, 293F:												
Chelsea----------	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
Lamont-----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	Moderate.
Fayette----------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Moderate.
315:												
Klum--------------	B	Frequent----	Brief------	Feb-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low-------	Low.
Perks-------------	A	Frequent----	Very brief to brief.	Feb-Nov	>6.0	---	---	>60	---	Low-------	Low-------	Moderate.
Nodaway-----------	B	Frequent----	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High------	Moderate	Low.
362, 363----------- Haig	C/D	None---------	---	---	1.0-2.0	Apparent	Nov-Jul	60	---	High------	High------	Moderate.
364B--------------- Grundy	C	None---------	---	---	1.0-3.0	Apparent	Nov-Jul	60	---	High------	High------	Moderate.
424D, 424D2, 424E, 424E2:												
Lindley----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Keswick----------	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
425D, 425D2-------- Keswick	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
452D2-------------- Lineville	C	None---------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
453---------------- Tuskeego	C/D	Rare---------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	Moderate	High------	Moderate.
478G:												
Nordness----------	B	None---------	---	---	>6.0	---	---	8-20	Hard	Low-------	Low-------	Low.
Rock outcrop.												
484---------------- Lawson	C	Occasional	Brief------	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High------	Moderate	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
499D, 499F-------- Nordness	B	None--------	---	---	>6.0	---	---	8-20	Hard	Low------	Low------	Low.
520--------------- Coppock	B	Occasional	Brief-----	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
570C, 570C2------- Nira	B	None--------	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Moderate.
571B, 571C2------- Hedrick	B	None--------	---	---	4.0-6.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Moderate.
594C2, 594D2, 594E, 594E2------ Galland	D	None--------	---	---	3.0-5.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
730B:												
Nodaway----------	B	Frequent----	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
Cantril----------	B	Rare--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	Moderate	Low.
731C2------------- Pershing	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
732C2, 732D2------ Weller	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.
764B-------------- Grundy	C	None--------	---	---	1.0-3.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
779--------------- Kalona	C	None--------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
792D2------------- Armstrong	C	None--------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
795D2------------- Ashgrove	D	None--------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-----	High-----	Moderate.
831C2------------- Pershing	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	Moderate.
832C2------------- Weller	C	None--------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-----	High-----	High.
876B, 876C2------- Ladoga	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
880B, 880C, 880C2, 880D2------------ Clinton	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
881B, 881C2-------- Otley	B	None----------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
977, 977B---------- Richwood	B	None----------	---	---	>6.0	---	---	>60	---	High------	Low-------	Low.
993D2:												
Gara--------------	C	None----------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Armstrong---------	C	None----------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High------	High------	Moderate.
1057--------------- Rushville	D	None----------	---	---	0-1.0	Apparent	Nov-Jul	>60	---	High------	High------	High.
1122*-------------- Sperry	C/D	None----------	---	---	+1-1.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1130--------------- Belinda	D	None----------	---	---	0.5-2.0	Apparent	Nov-Jul	>60	---	Moderate	High------	Moderate.
1131B-------------- Pershing	C	None----------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1132B-------------- Weller	C	None----------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High------	High.
1133--------------- Colo	B/D	Frequent-----	Very brief to long.	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1180B-------------- Keomah	C	None----------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1279--------------- Taintor	C/D	None----------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1280, 1280B-------- Mahaska	B	None----------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1315:												
Klum--------------	B	Frequent-----	Brief------	Feb-Nov	3.0-6.0	Apparent	Nov-Jul	>60	---	Moderate	Low-------	Low.
Perks-------------	A	Frequent-----	Very brief to brief.	Feb-Nov	>6.0	---	---	>60	---	Low-------	Low-------	Moderate.
Nodaway-----------	B	Frequent-----	Very brief to brief.	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High------	Moderate	Low.
1362--------------- Haig	C/D	None----------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.
1779--------------- Kalona	C	None----------	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	High------	High------	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Map symbol and soil name	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
5010, 5030. Pits												
5040. Orthents												

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
*Adair	Fine, montmorillonitic, mesic Aquic Argiudolls
Ainsworth	Fine, montmorillonitic, mesic Typic Hapludalfs
Arispe	Fine, montmorillonitic, mesic Aquic Argiudolls
Armstrong	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Ashgrove	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
Beckwith	Fine, montmorillonitic, mesic Typic Albaqualfs
Belinda	Fine, montmorillonitic, mesic Mollic Albaqualfs
Cantril	Fine-loamy, mixed, mesic Udollic Ochraqualfs
Chelsea	Mixed, mesic Alfic Udipsamments
Clarinda	Fine, montmorillonitic, mesic, sloping Typic Argiaquolls
Clinton	Fine, montmorillonitic, mesic Typic Hapludalfs
Colo	Fine-silty, mixed, mesic Cumulic Haplaquolls
Coppock	Fine-silty, mixed, mesic Mollic Ochraqualfs
Dickinson	Coarse-loamy, mixed, mesic Typic Hapludolls
Douds	Fine-loamy, mixed, mesic Typic Hapludalfs
Edina	Fine, montmorillonitic, mesic Typic Argialbolls
Fayette	Fine-silty, mixed, mesic Typic Hapludalfs
Galland	Fine, montmorillonitic, mesic Aquic Hapludalfs
Gara	Fine-loamy, mixed, mesic Mollic Hapludalfs
Givin	Fine, montmorillonitic, mesic Udollic Ochraqualfs
Grundy	Fine, montmorillonitic, mesic Aquic Argiudolls
Haig	Fine, montmorillonitic, mesic Typic Argiaquolls
Hedrick	Fine-silty, mixed, mesic Mollic Hapludalfs
Hoopeston	Coarse-loamy, mixed, mesic Aquic Hapludolls
Kalona	Fine, montmorillonitic, mesic Typic Haplaquolls
Keomah	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Keswick	Fine, montmorillonitic, mesic Aquic Hapludalfs
Klum	Coarse-loamy, mixed, nonacid, mesic Mollic Udifluvents
Ladoga	Fine, montmorillonitic, mesic Mollic Hapludalfs
Lamont	Coarse-loamy, mixed, mesic Typic Hapludalfs
Lawson	Fine-silty, mixed, mesic Cumulic Hapludolls
Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Lineville	Fine-loamy, mixed, mesic Aquollic Hapludalfs
Mahaska	Fine, montmorillonitic, mesic Aquic Argiudolls
Nevin	Fine-silty, mixed, mesic Aquic Argiudolls
Nira	Fine-silty, mixed, mesic Typic Hapludolls
Nodaway	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
Nordness	Loamy, mixed, mesic Lithic Hapludalfs
*Okaw	Fine, montmorillonitic, mesic Typic Albaqualfs
Orthents	Loamy, mixed, mesic Udorthents
Otley	Fine, montmorillonitic, mesic Typic Argiudolls
Perks	Mixed, mesic Typic Udipsamments
Pershing	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Richwood	Fine-silty, mixed, mesic Typic Argiudolls
Rinda	Fine, montmorillonitic, mesic, sloping Mollic Ochraqualfs
Rushville	Fine, montmorillonitic, mesic Typic Albaqualfs
Sparta	Sandy, mixed, mesic Entic Hapludolls
Sperry	Fine, montmorillonitic, mesic Typic Argialbolls
Taintor	Fine, montmorillonitic, mesic Typic Argiaquolls
Tuskeego	Fine, montmorillonitic, mesic Mollic Ochraqualfs
Vesser	Fine-silty, mixed, mesic Argiaquic Argialbolls
Weller	Fine, montmorillonitic, mesic Aquic Hapludalfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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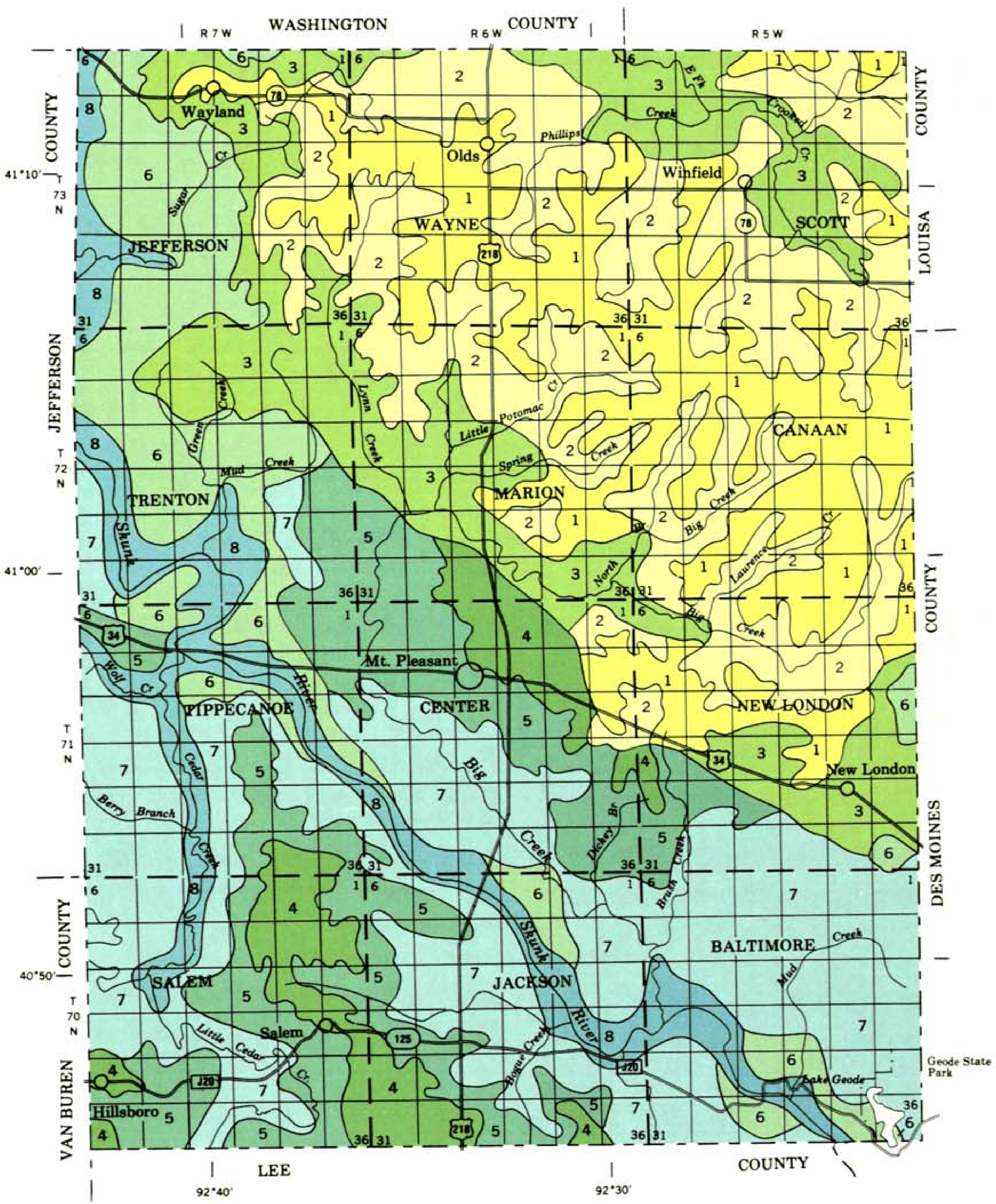


SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

SOIL ASSOCIATIONS*

1 TAINTOR-MAHASKA-KALONA association: Nearly level and level, poorly drained and somewhat poorly drained, silty soils formed in loess; on uplands

2 OTLEY-MAHASKA-NIRA association: Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess; on uplands

3 LADOGA-GIVIN-HEDRICK association: Nearly level to moderately sloping, moderately well drained and somewhat poorly drained, silty soils formed in loess; on uplands

4 HAIG-GRUNDY-ARISPE association: Nearly level to moderately sloping, poorly drained to moderately well drained, silty soils formed in loess; on uplands

5 PERSHING-BELINDA-RINDA association: Nearly level to strongly sloping, moderately well drained to poorly drained, silty soils formed in loess and glacial till; on uplands

6 CLINTON-LINDLEY-KESWICK association: Gently sloping to very steep, moderately well drained and well drained, silty and loamy soils formed in loess and glacial till; on uplands

7 WELLER-LINDLEY-KESWICK association: Gently sloping to very steep, moderately well drained and well drained, silty and loamy soils formed in loess and glacial till; on uplands

8 NODAWAY-COLO association: Nearly level and gently sloping, moderately well drained and poorly drained, silty soils formed in recent alluvium; on bottom lands

*Texture terms refer to the surface layer of the major soils.

Compiled 1983

U. S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE, IOWA STATE UNIVERSITY
DEPARTMENT OF SOIL CONSERVATION, STATE OF IOWA

N

GENERAL SOIL MAP

HENRY COUNTY, IOWA

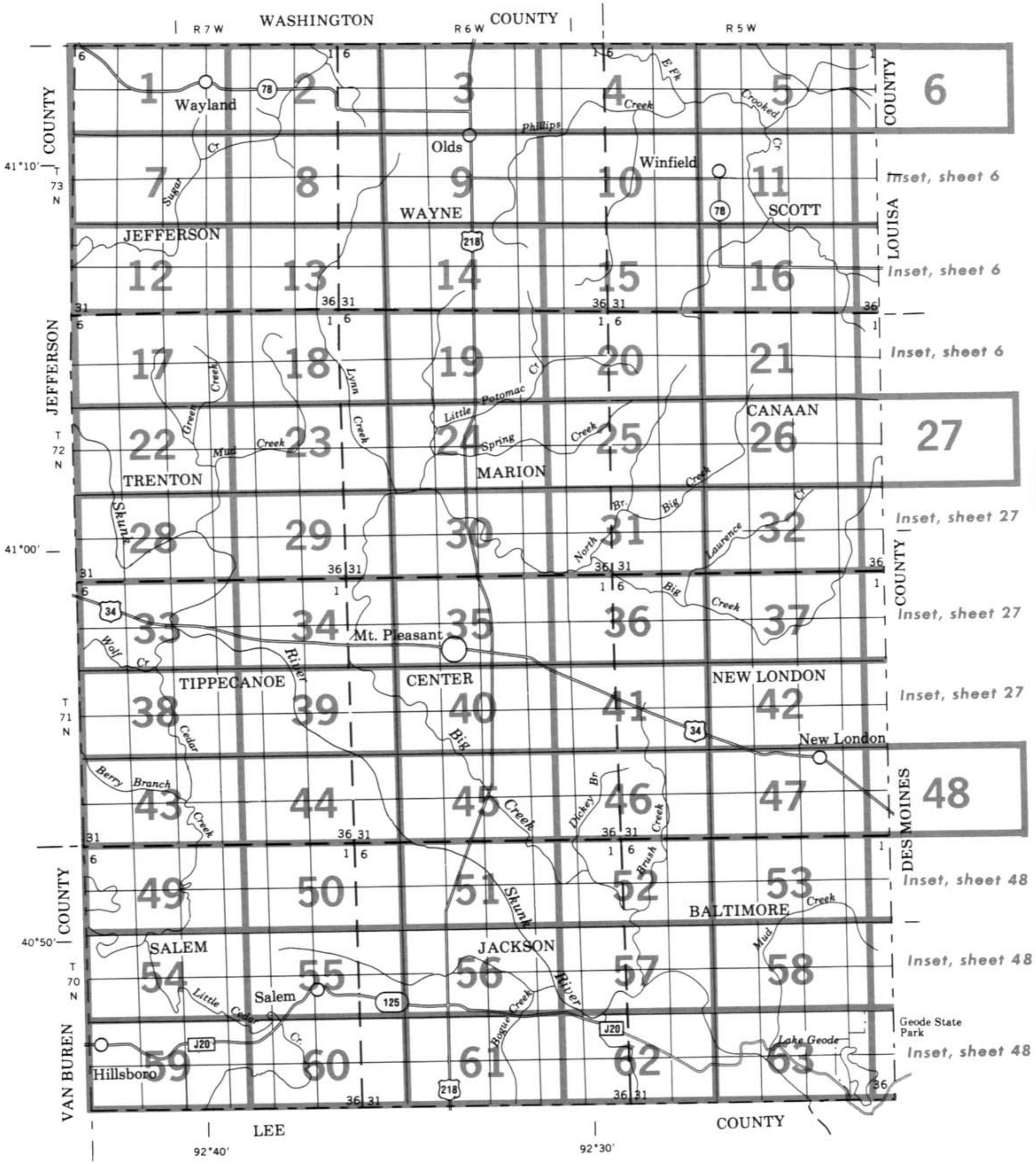
Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

Original text from each individual map sheet read:
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1978 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



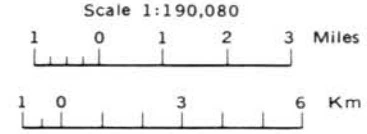
SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

HENRY COUNTY, IOWA

Scale 1:190,080



HENRY COUNTY, IOWA

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded.

SYMBOL	NAME
13B	Vesser-Colo complex, 2 to 5 percent slopes
23C	Arispe silty clay loam, 5 to 9 percent slopes
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded
41B	Sparta loamy fine sand, 2 to 5 percent slopes
51	Vesser silt loam, 0 to 2 percent slopes
56B	Cantril loam, 2 to 5 percent slopes
58E	Douds loam, 14 to 18 percent slopes
58F	Douds loam, 18 to 40 percent slopes
65E	Lindley loam, 14 to 18 percent slopes
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded
65F	Lindley loam, 18 to 25 percent slopes
65G	Lindley loam, 25 to 40 percent slopes
75	Givin silt loam, 0 to 2 percent slopes
75B	Givin silt loam, 2 to 5 percent slopes
76B	Ladoga silt loam, 2 to 5 percent slopes
76C	Ladoga silt loam, 5 to 9 percent slopes
76C2	Ladoga silt loam, 5 to 9 percent slopes, moderately eroded
76D2	Ladoga silt loam, 9 to 14 percent slopes, moderately eroded
80B	Clinton silt loam, 2 to 5 percent slopes
80C	Clinton silt loam, 5 to 9 percent slopes
80C2	Clinton silt loam, 5 to 9 percent slopes, moderately eroded
880D	Clinton silt loam, 9 to 14 percent slopes
80D2	Clinton silt loam, 9 to 14 percent slopes, moderately eroded
88	Nevin silty clay loam, 0 to 2 percent slopes
110B	Lamont fine sandy loam, 2 to 5 percent slopes
110C	Lamont fine sandy loam, 5 to 9 percent slopes
122	Sperry silt loam, 0 to 1 percent slopes
130	Belinda silt loam, 0 to 2 percent slopes
131B	Pershing silt loam, 2 to 5 percent slopes
131C	Pershing silt loam, 5 to 9 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes
132C	Weller silt loam, 5 to 9 percent slopes
133	Colo silty clay loam, 0 to 2 percent slopes
133B	Colo silty clay loam, 2 to 5 percent slopes
133+	Colo silt loam, overwash, 0 to 2 percent slopes
154E	Ainsworth-Lamont complex, 9 to 18 percent slopes
163B	Fayette silt loam, 2 to 5 percent slopes
163C2	Fayette silt loam, 5 to 9 percent slopes, moderately eroded
173	Hoopeston fine sandy loam, 0 to 2 percent slopes
175	Dickinson fine sandy loam, 0 to 2 percent slopes
179E	Gara loam, 14 to 18 percent slopes
179E2	Gara loam, 14 to 18 percent slopes, moderately eroded
180	Keomah silt loam, 0 to 2 percent slopes
180B	Keomah silt loam, 2 to 5 percent slopes
192D2	Adair loam, 9 to 14 percent slopes, moderately eroded
208	Klum fine sandy loam, 0 to 2 percent slopes
211	Edina silt loam, 0 to 1 percent slopes
220	Nodaway silt loam, 0 to 2 percent slopes
222C	Clarinda silty clay loam, 5 to 9 percent slopes
22C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded
223D2	Rinda silty clay loam, 9 to 14 percent slopes, moderately eroded
260	Beckwith silt loam, 0 to 2 percent slopes
263	Okaw silt loam, 0 to 2 percent slopes
263B	Okaw silt loam, 2 to 5 percent slopes
264B	Ainsworth silt loam, 2 to 5 percent slopes
264C2	Ainsworth silt loam, 5 to 9 percent slopes, moderately eroded
279	Taintor silty clay loam, 0 to 2 percent slopes
280	Mahaska silty clay loam, 0 to 2 percent slopes
280B	Mahaska silty clay loam, 2 to 5 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes
281C	Otley silty clay loam, 5 to 9 percent slopes
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded
293B	Chelsea-Lamont-Fayette complex, 2 to 5 percent slopes
293C	Chelsea-Lamont-Fayette complex, 5 to 9 percent slopes

SYMBOL	NAME
293E	Chelsea-Lamont-Fayette complex, 9 to 18 percent slopes
293F	Chelsea-Lamont-Fayette complex, 18 to 25 percent slopes
315	Klum-Perks-Nodaway complex, 1 to 3 percent slopes
362	Haig silt loam, 0 to 2 percent slopes
363	Haig silty clay loam, 0 to 2 percent slopes
364B	Grundy silt loam, 2 to 5 percent slopes
424D	Lindley-Keswick loams, 9 to 14 percent slopes
424D2	Lindley-Keswick loams, 9 to 14 percent slopes, moderately eroded
424E	Lindley-Keswick loams, 14 to 18 percent slopes
424E2	Lindley-Keswick loams, 14 to 18 percent slopes, moderately eroded
425D	Keswick loam, 9 to 14 percent slopes
425D2	Keswick loam, slopes, 9 to 14 percent slopes, moderately eroded
452D2	Lineville silt loam, 9 to 14 percent slopes, moderately eroded
453	Tuskeego silt loam, 0 to 2 percent slopes
478G	Nordness-Rock outcrop complex, 25 to 40 percent slopes
484	Lawson silt loam, 0 to 2 percent slopes
499D	Nordness silt loam, 9 to 14 percent slopes
499F	Nordness silt loam, 14 to 25 percent slopes
520	Coppock silt loam, 0 to 2 percent slopes
570C	Nira silty clay loam, 5 to 9 percent slopes
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded
571B	Hedrick silt loam, 2 to 5 percent slopes
571C2	Hedrick silt loam, 5 to 9 percent slopes,moderately eroded
594C2	Galland loam, 5 to 9 percent slopes, moderately eroded
594D2	Galland loam, 9 to 14 percent slopes, moderately eroded
594E	Galland loam, 14 to 18 percent slopes
594E2	Galland loam, 14 to 18 percent slopes, moderately eroded
730B	Nodaway-Cantril complex, 2 to 5 percent slopes
731C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded
732C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded
732D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded
764B	Grundy silt loam, benches, 2 to 5 percent slopes
779	Kalona silty clay loam, 0 to 1 percent slopes
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded
832C2	Pershing silty clay loam, benches, 5 to 9 percent slopes, moderately eroded
832C2	Weller silty clay loam, benches, 5 to 9 percent slopes, moderately eroded
876B	Ladoga silt loam, benches, 2 to 5 percent slopes
876C2	Ladoga silt loam, benches, 5 to 9 percent slopes, moderately eroded
880B	Clinton silt loam, benches, 2 to 5 percent slopes
880C	Clinton silt loam, benches, 5 to 9 percent slopes
880C2	Clinton silt loam, benches, 5 to 9 percent slopes, moderately eroded
880D2	Clinton silt loam, benches, 9 to 14 percent slopes, moderately eroded
881B	Otley silty clay loam, benches, 2 to 5 percent slopes
881C2	Otley silty clay loam, benches, 5 to 9 percent slopes,moderately eroded
977	Richwood silt loam, 0 to 2 percent slopes
977B	Richwood silt loam, 2 to 5 percent slopes
993D2	Gara-Armstrong loams, 9 to 14 percent slopes, moderately eroded
1057	Rushville silt loam, benches, 0 to 2 percent slopes
1122	Sperry silt loam, benches, 0 to 1 percent slopes
1130	Belinda silt loam, benches, 0 to 2 percent slopes
1131B	Pershing silt loam, benches, 2 to 5 percent slopes
1132B	Weller silt loam, benches, 2 to 5 percent slopes
1133	Colo silty clay loam, channeled, 0 to 2 percent slopes
1180B	Keomah silt loam, benches, 2 to 5 percent slopes
1279	Taintor silty clay loam, benches, 0 to 2 percent slopes
1280	Mahaska silty clay loam, benches, 0 to 2 percent slopes
1280B	Mahaska silty clay loam, benches, 2 to 5 percent slopes
1315	Klum-Perks-Nodaway complex, channeled, 1 to 3 percent slopes
1362	Haig silt loam, benches, 0 to 2 percent slopes
1779	Kalona silty clay loam, benches, 0 to 1 percent slopes
5010	Pits, sand and gravel
5030	Pits, limestone quarry
5040	Orthents, loamy

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, cemetery — Davis Airstrip

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads

ROAD EMBLEMS & DESIGNATIONS

- Federal — 410
- State — 52

RAILROAD

DAMS

- Large (to scale)
- Medium or small — water

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
  - Crossable with tillage implements
  - Not crossable with tillage implements
- Drainage end
- Canals or ditches
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water
- Intermittent — int

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 281B 280

ESCARPMENTS

- Bedrock (points down slope)
- Other than bedrock (points down slope)

SHORT STEEP SLOPE

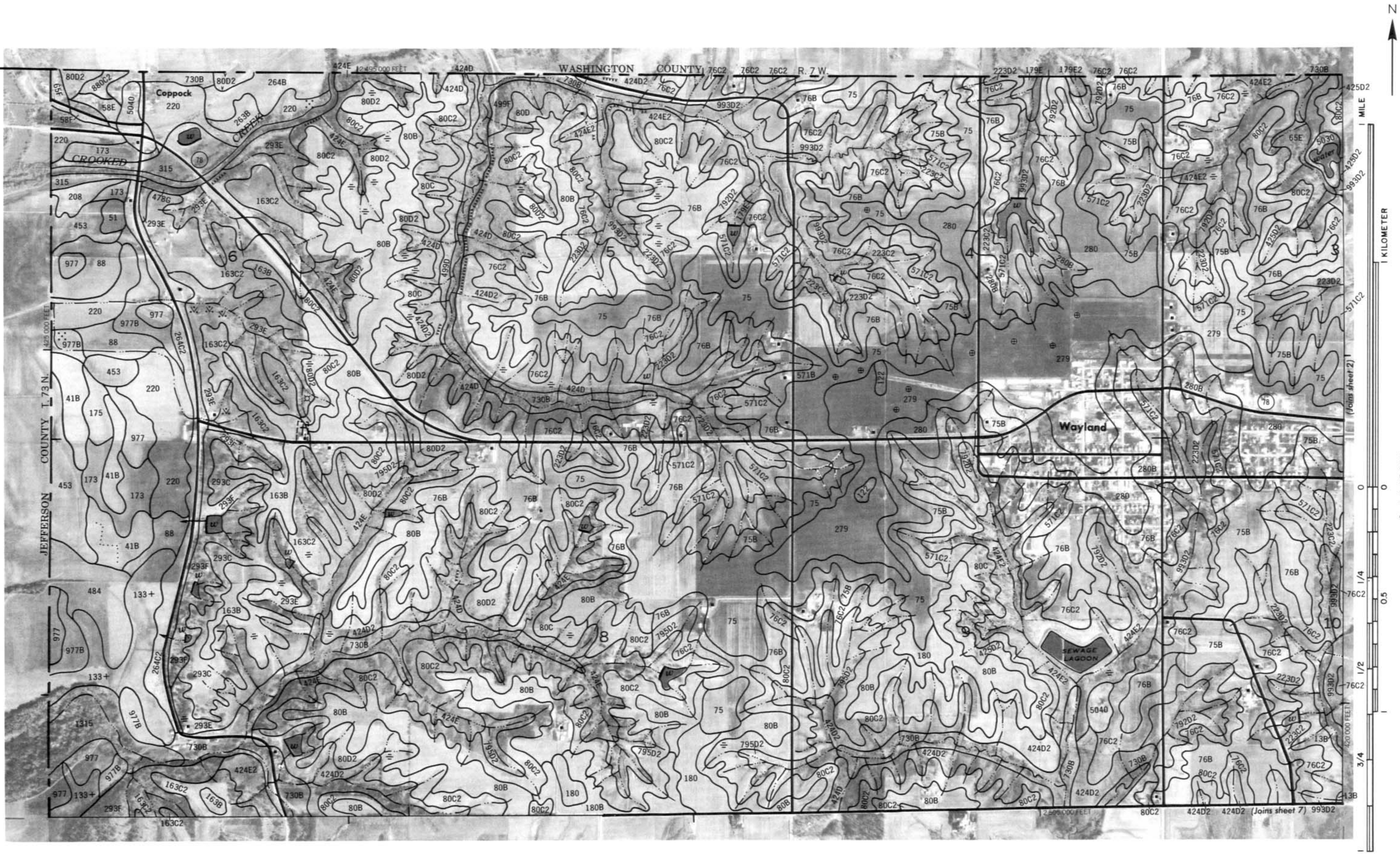
GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown) — S

MISCELLANEOUS

- Gravelly spot
- Rock outcrop (includes sandstone)
- Sandy spot
- Severely eroded spot
- Spot of gray paleosol
- Shallow depressional area
- Spot of Edina soil
- Spot of Sperry soil
- Borrow area
- Shale outcrop
- Spot of reddish paleosol
- Glacial till
- Sewage lagoon — S.L.


N
WASHINGTON COUNTY
R. 7 W.
JEFFERSON COUNTY
T. 73 N.
Coppock
CROOKED CREEK
Wayland
SEWAGE LAGOON
water
2 495 000 FEET
2 505 000 FEET
425 000 FEET
420 000 FEET
(Joins sheet 2)
(Joins sheet 7)
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
6
5
4
3
7
8
9
10
78

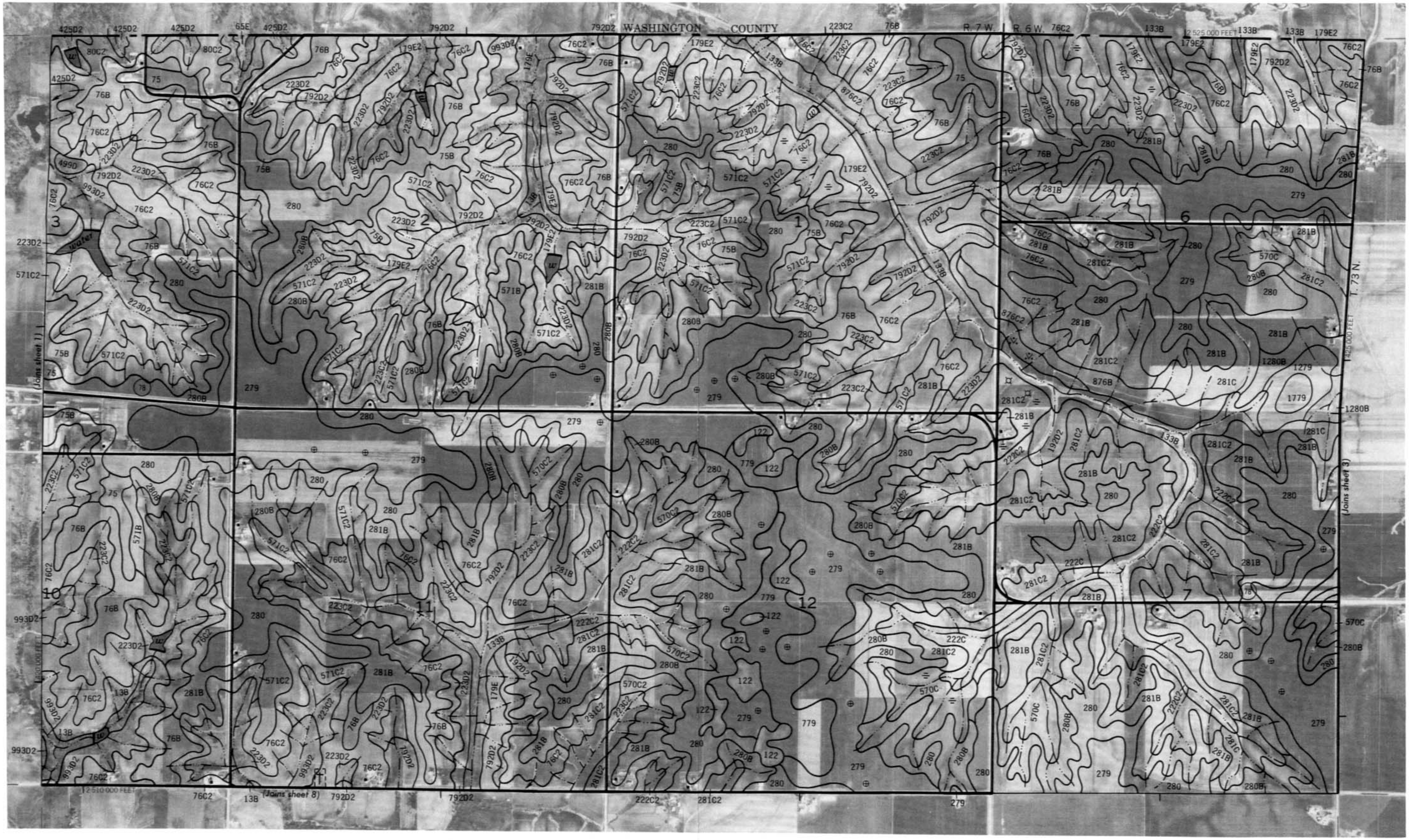
2

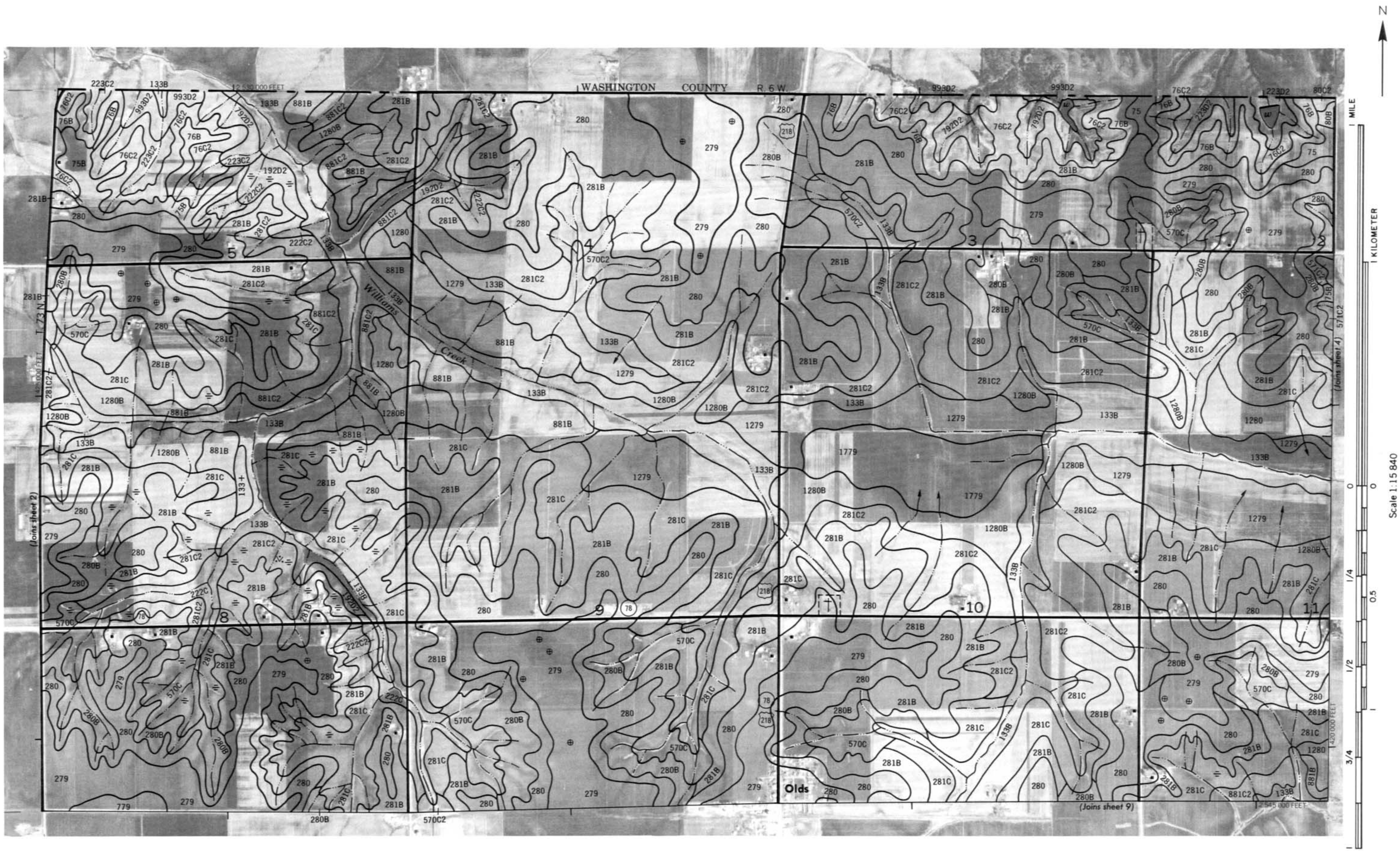
N

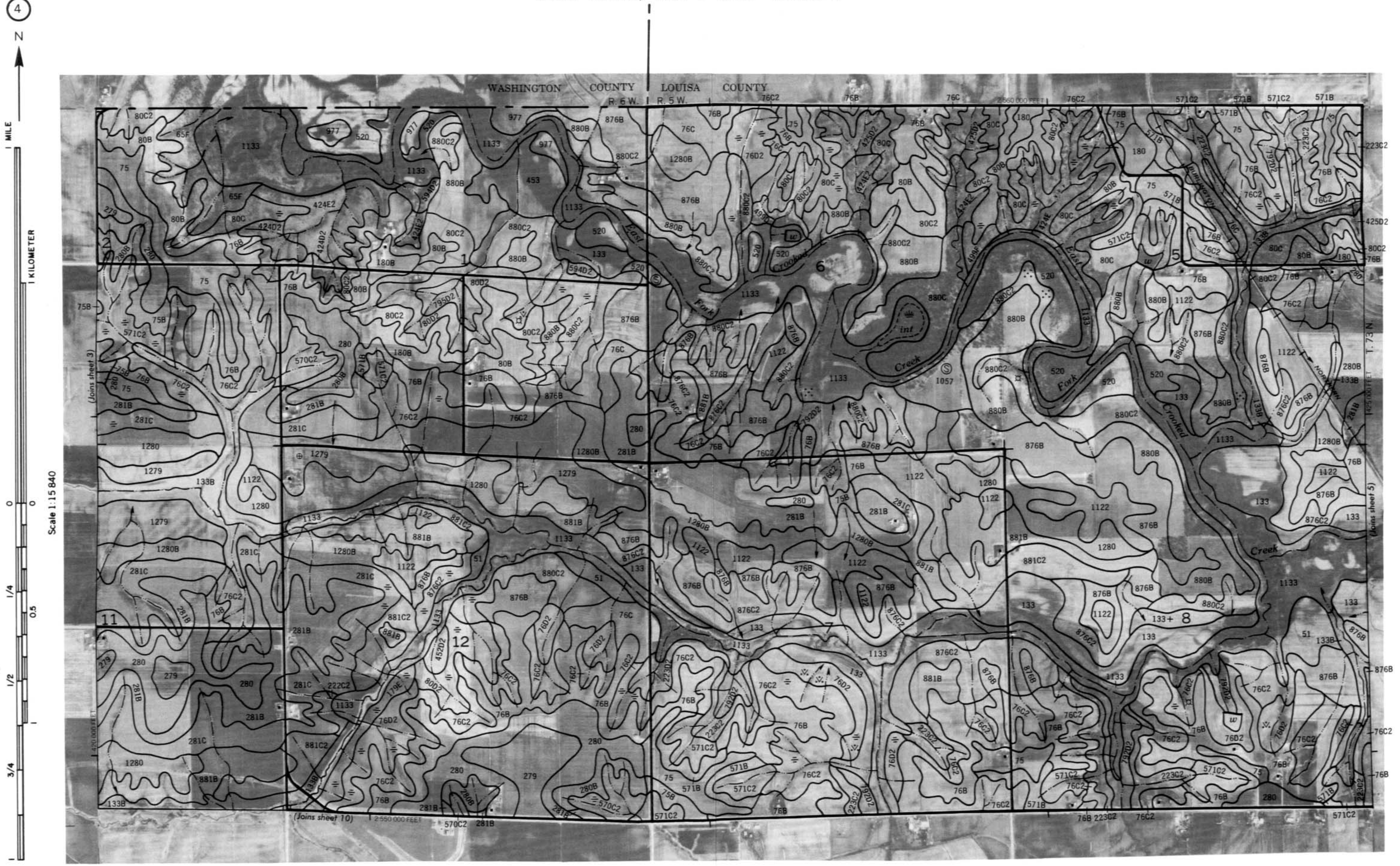
MILE

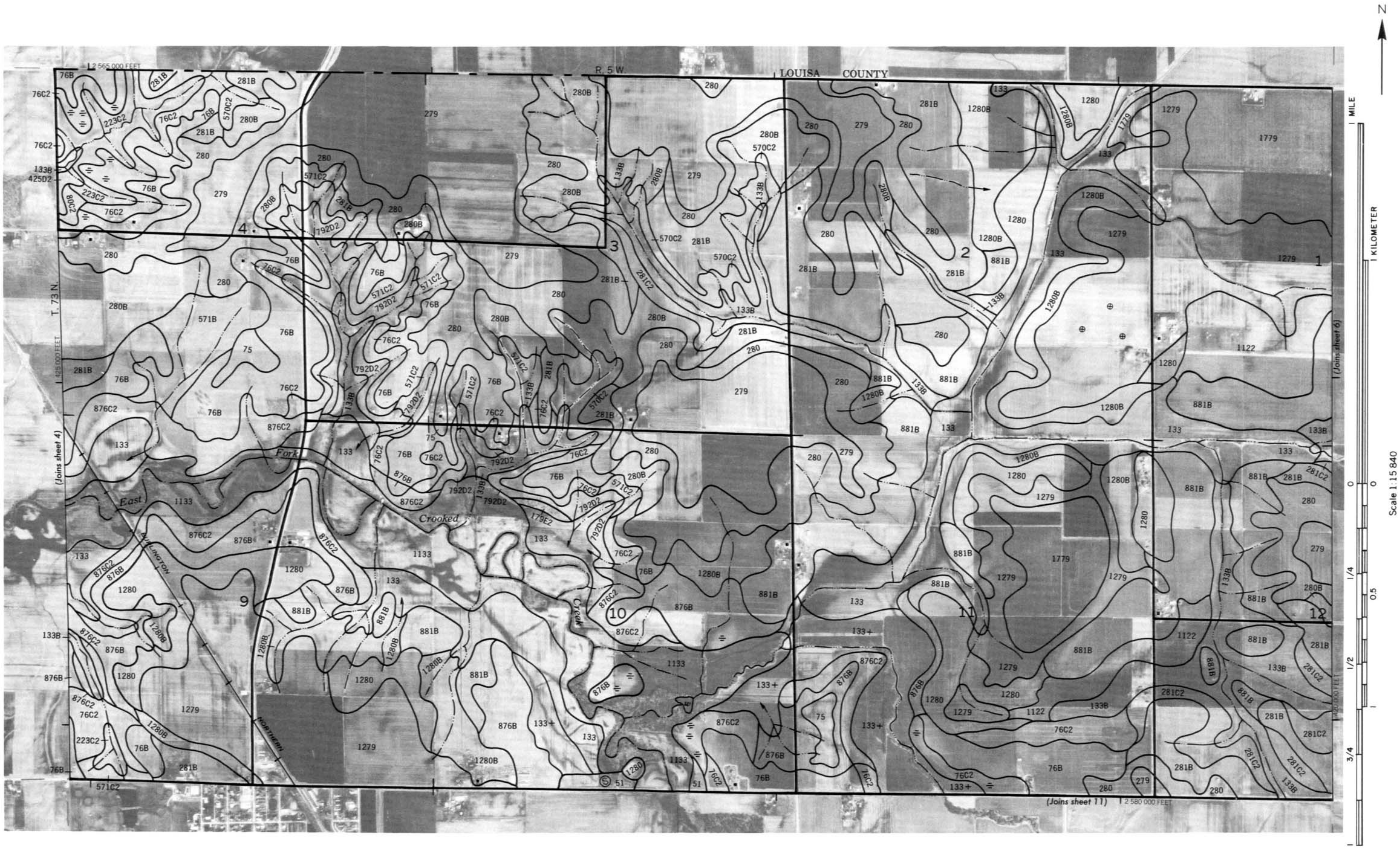
KILOMETER

Scale 1:15 840

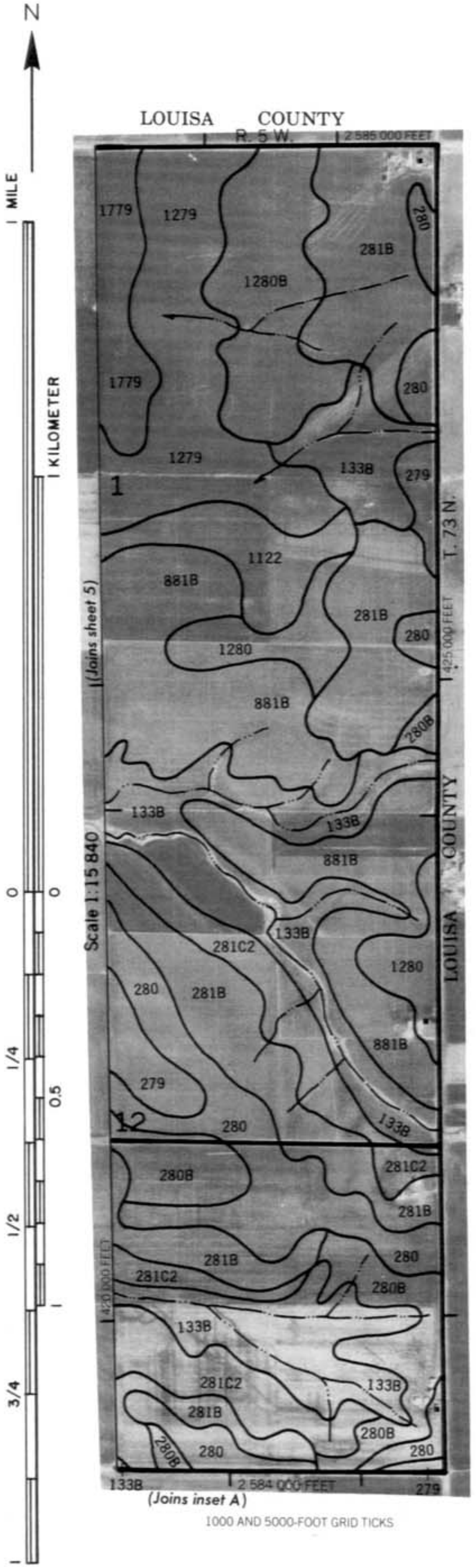



3
N
WASHINGTON COUNTY
R. 6 W.
T. 73 N.
Williams Creek
Olds
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 9)
2 530 000 FEET
420 000 FEET
2 545 000 FEET
MILE
KILOMETER
Scale 1:15 840


4
N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
WASHINGTON COUNTY
LOUISA COUNTY
R. 6 W.
R. 5 W.
T. 73 N.
(Joins sheet 3)
(Joins sheet 5)
(Joins sheet 10)
2 560 000 FEET
2 550 000 FEET
East Fork Crooked Creek
int
1
2
5
6
7
8
11
12

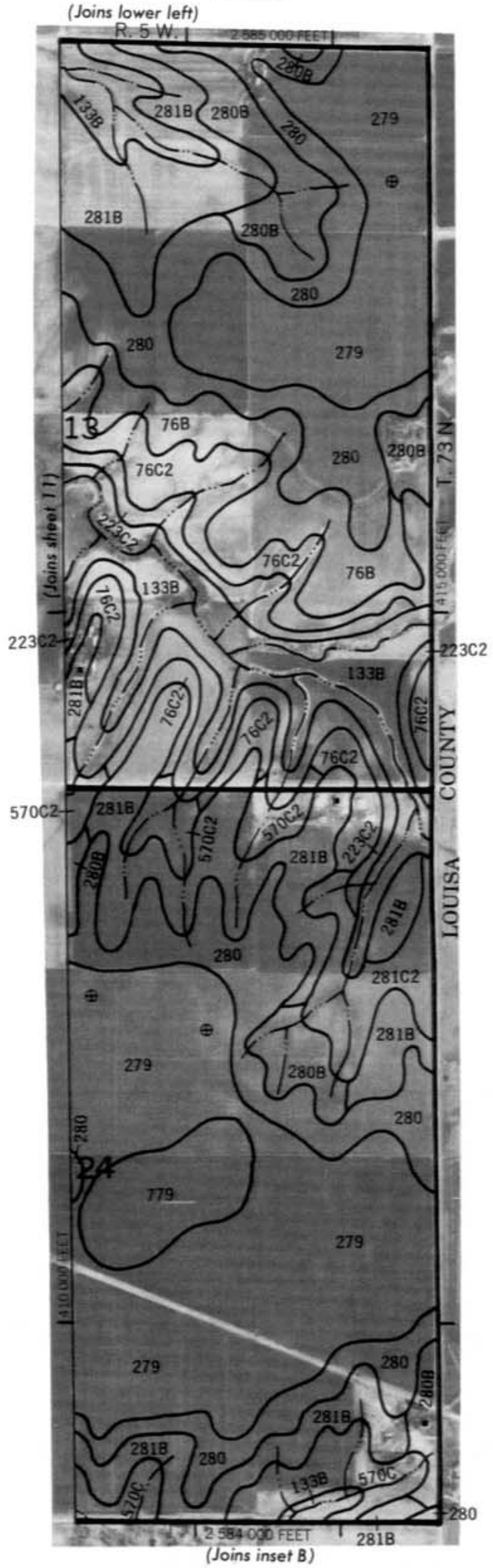

N
R. 5 W.
LOUISA COUNTY
T. 73 N.
2 565 000 FEET
425 000 FEET
2 580 000 FEET
(Joins sheet 4)
(Joins sheet 6)
(Joins sheet 11)
East Fork
Crooked Creek
BURLINGTON NORTHERN
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
1
2
3
4
9
10
11
12

6



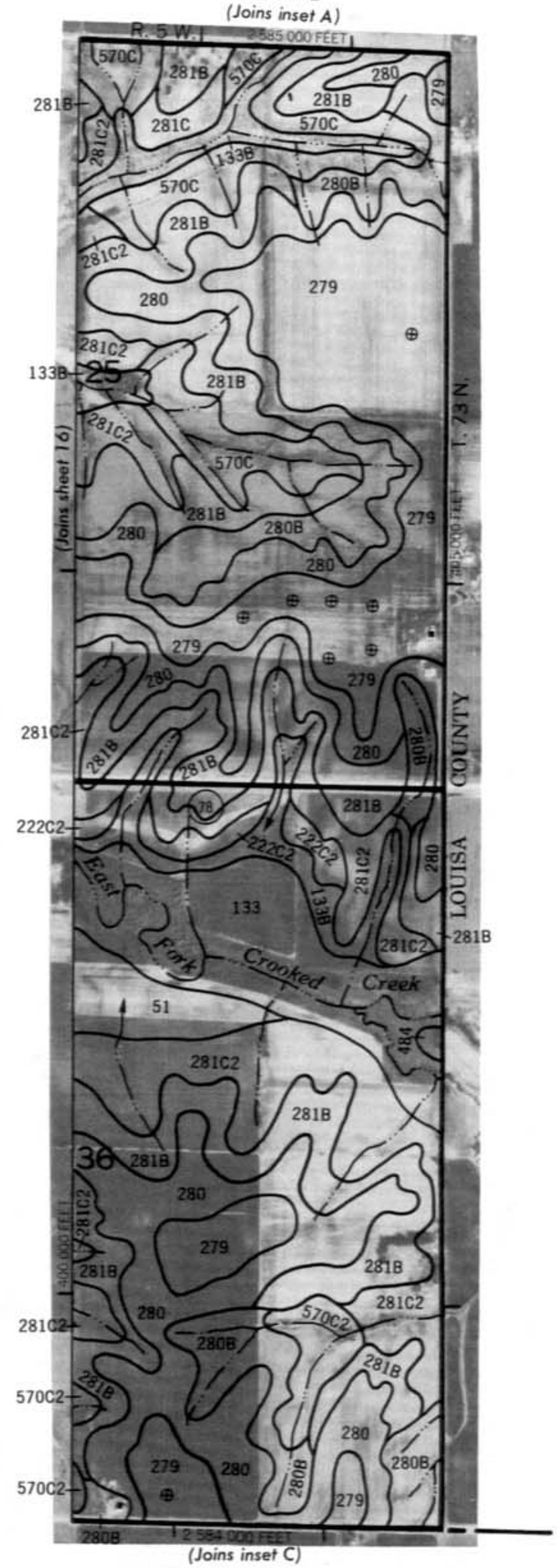
1000 AND 5000-FOOT GRID TICKS

INSET A



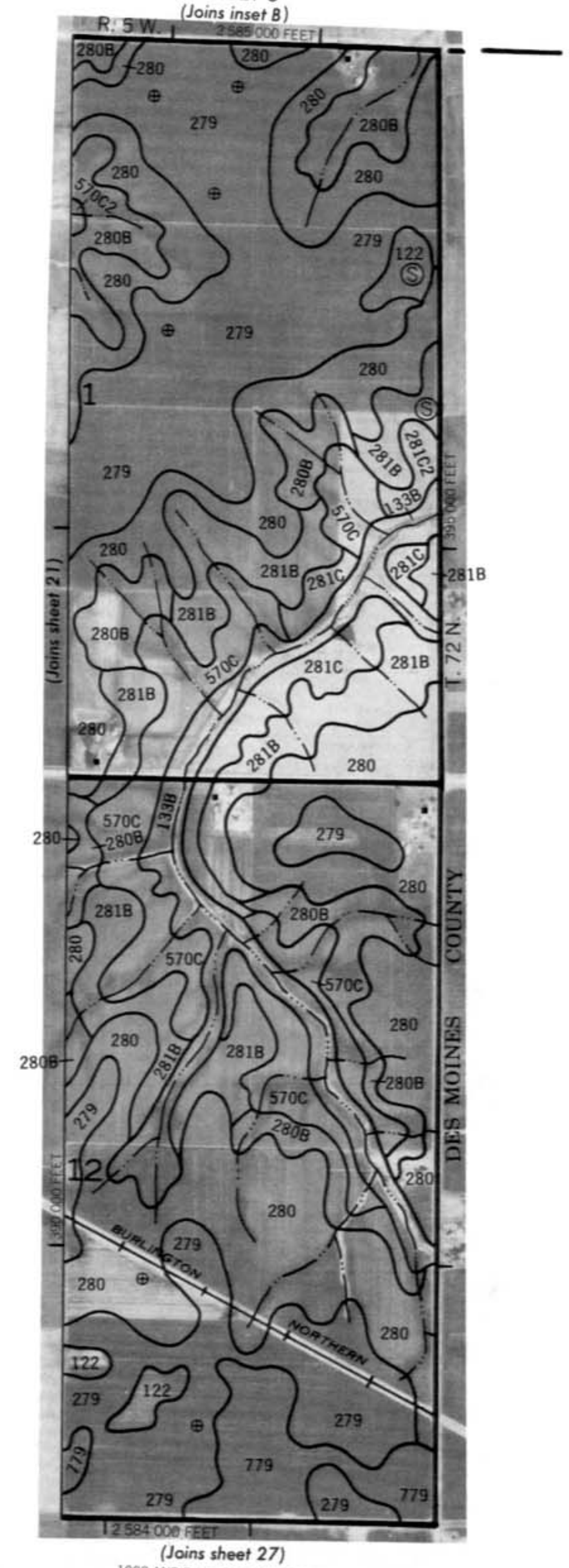
1000 AND 5000-FOOT GRID TICKS

INSET B

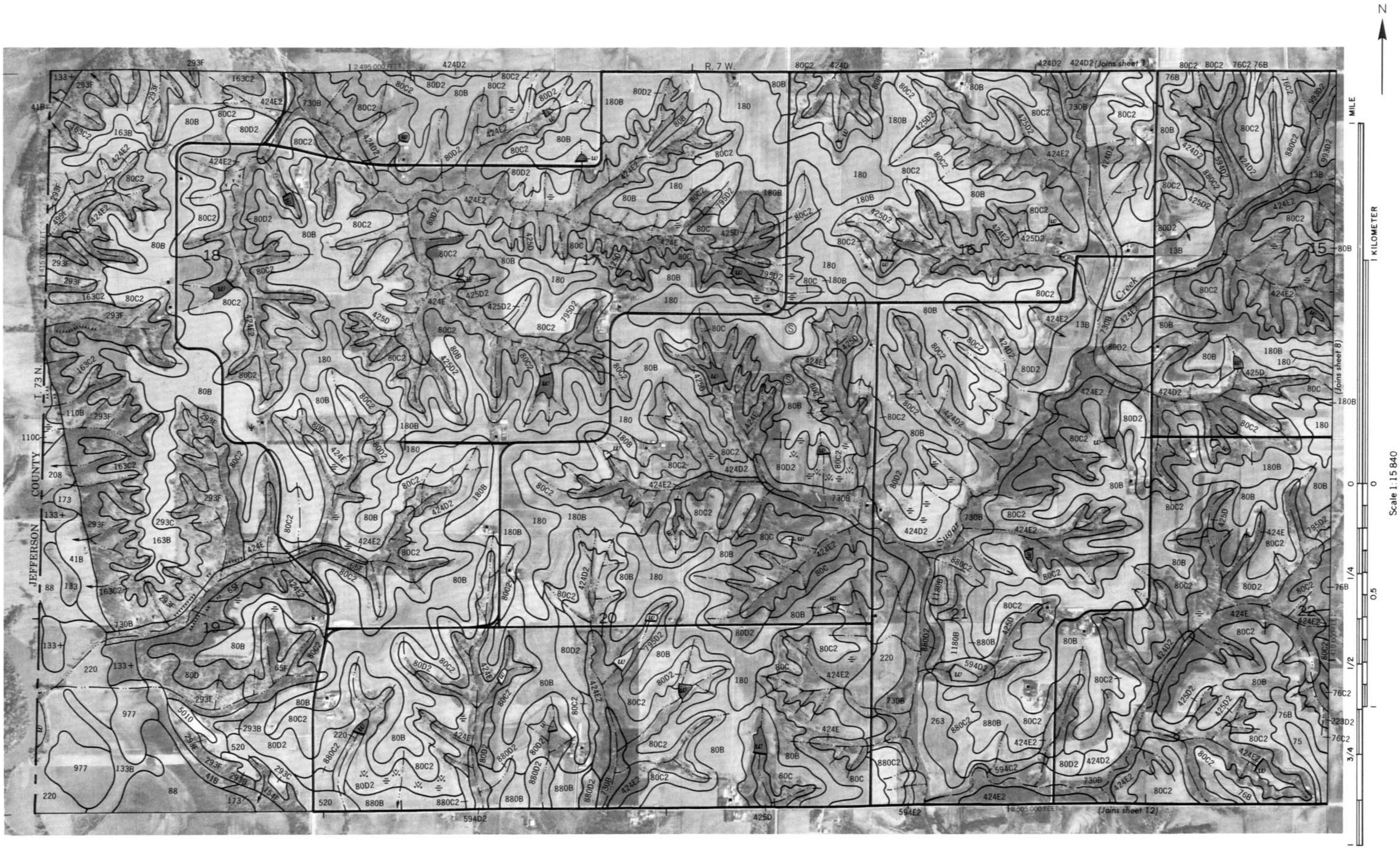


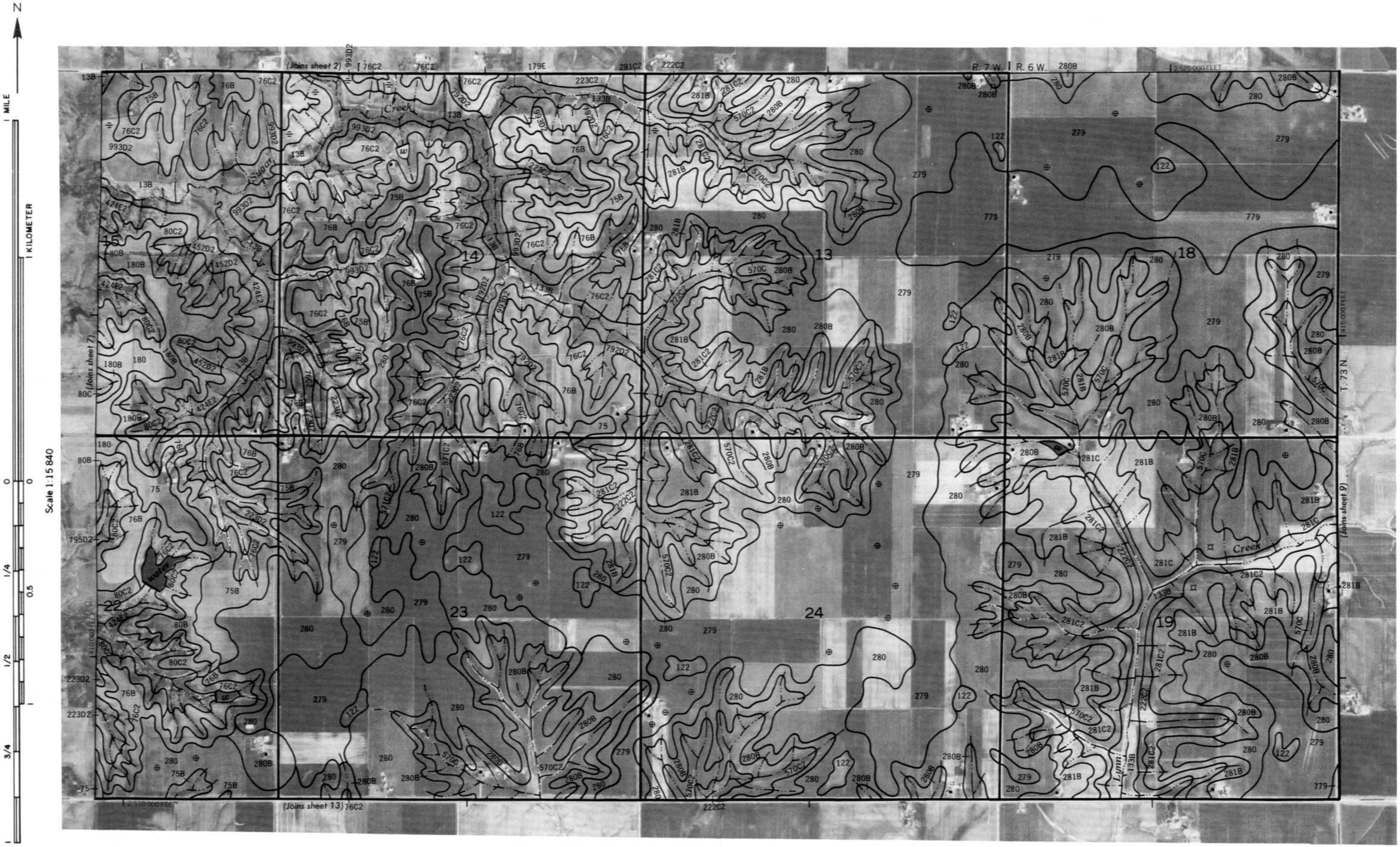
1000 AND 5000-FOOT GRID TICKS

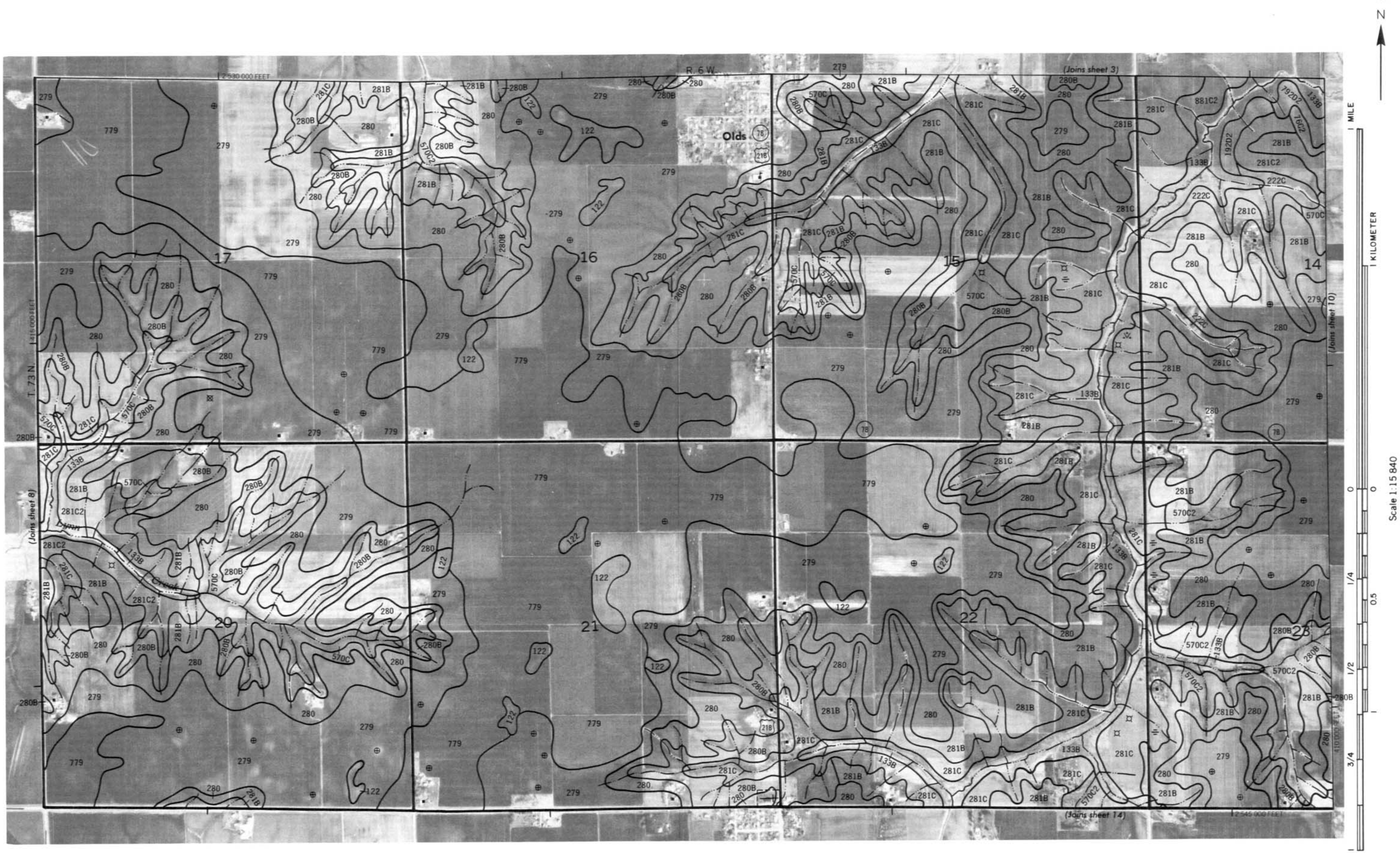
INSET C



1000 AND 5000-FOOT GRID TICKS


N
R. 7 W.
T. 73 N.
JEFFERSON COUNTY
2 495 000 FEET
2 505 000 FEET
(Joins sheet 1)
(Joins sheet 8)
(Joins sheet 12)
Sugar
Creek
18
17
16
15
19
20
21
22
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5


N
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
(Joins sheet 2)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 13)
R. 7 W.
R. 6 W.
T. 73 N.
2 525 000 FEET
2 510 000 FEET
415 000 FEET
410 000 FEET
13
14
15
18
19
22
23
24
Sugar
Creek
Lynn
water


N
(Joins sheet 3)
(Joins sheet 10)
(Joins sheet 14)
(Joins sheet 8)
R. 6 W.
T. 73 N.
2 530 000 FEET
2 545 000 FEET
Olds
78
218
17
16
15
14
20
21
22
23
279
779
280
280B
281B
281C
281C2
122
133B
570C
570C2
222C
192D2
881C2
Creek
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

N

1 MILE

1 KILOMETER

Scale 1:15 840

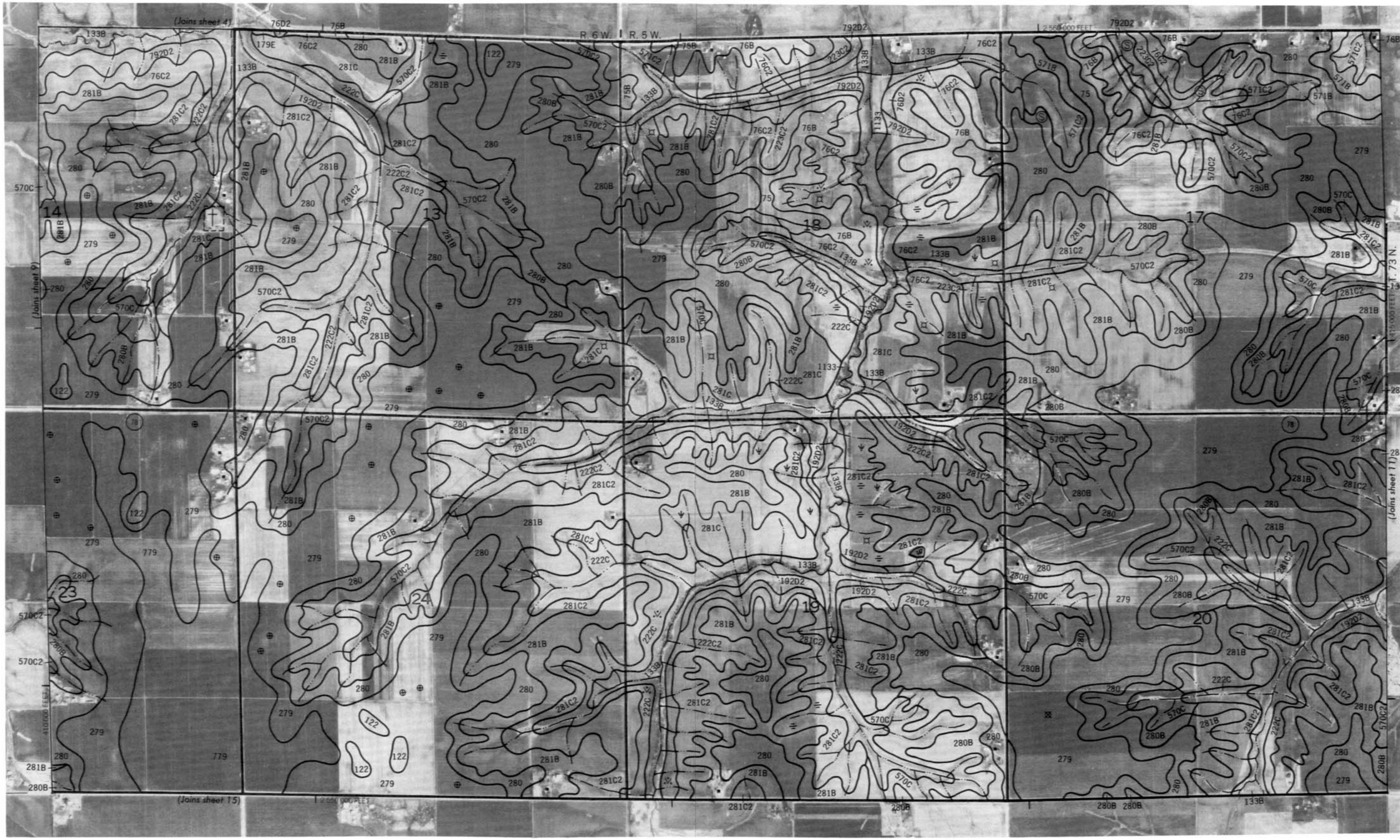
0 0

1/4

0.5

1/2

3/4




N
Winfield
R. 5 W.
T. 73 N.
(Joins sheet 5)
(Joins sheet 10)
(Joins sheet 16)
(Joins inset A, sheet 6)
East Fork Crooked Creek
BURLINGTON NORTHERN
2 565 000 FEET
2 580 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

12

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0

1/4

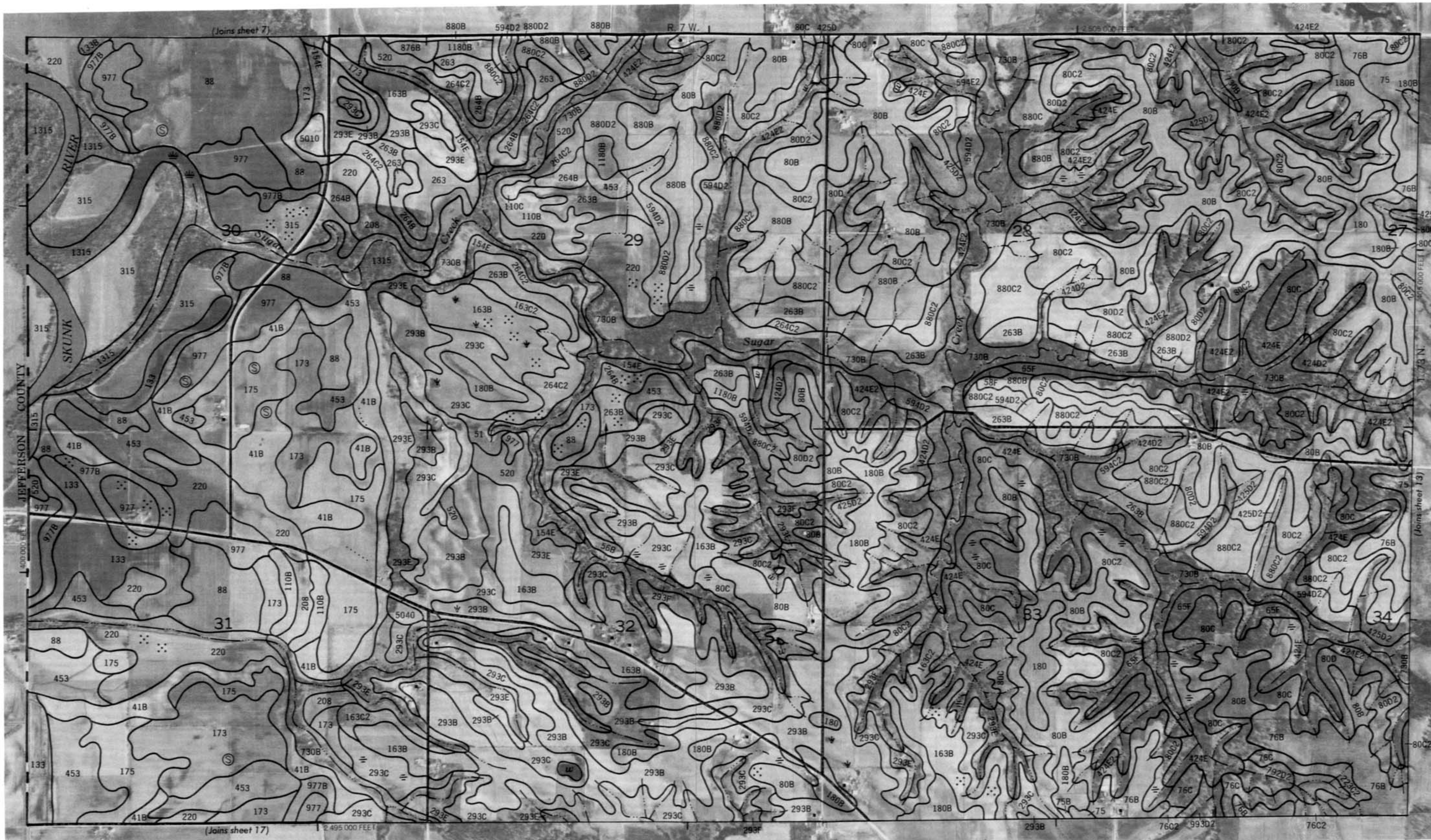
0.5

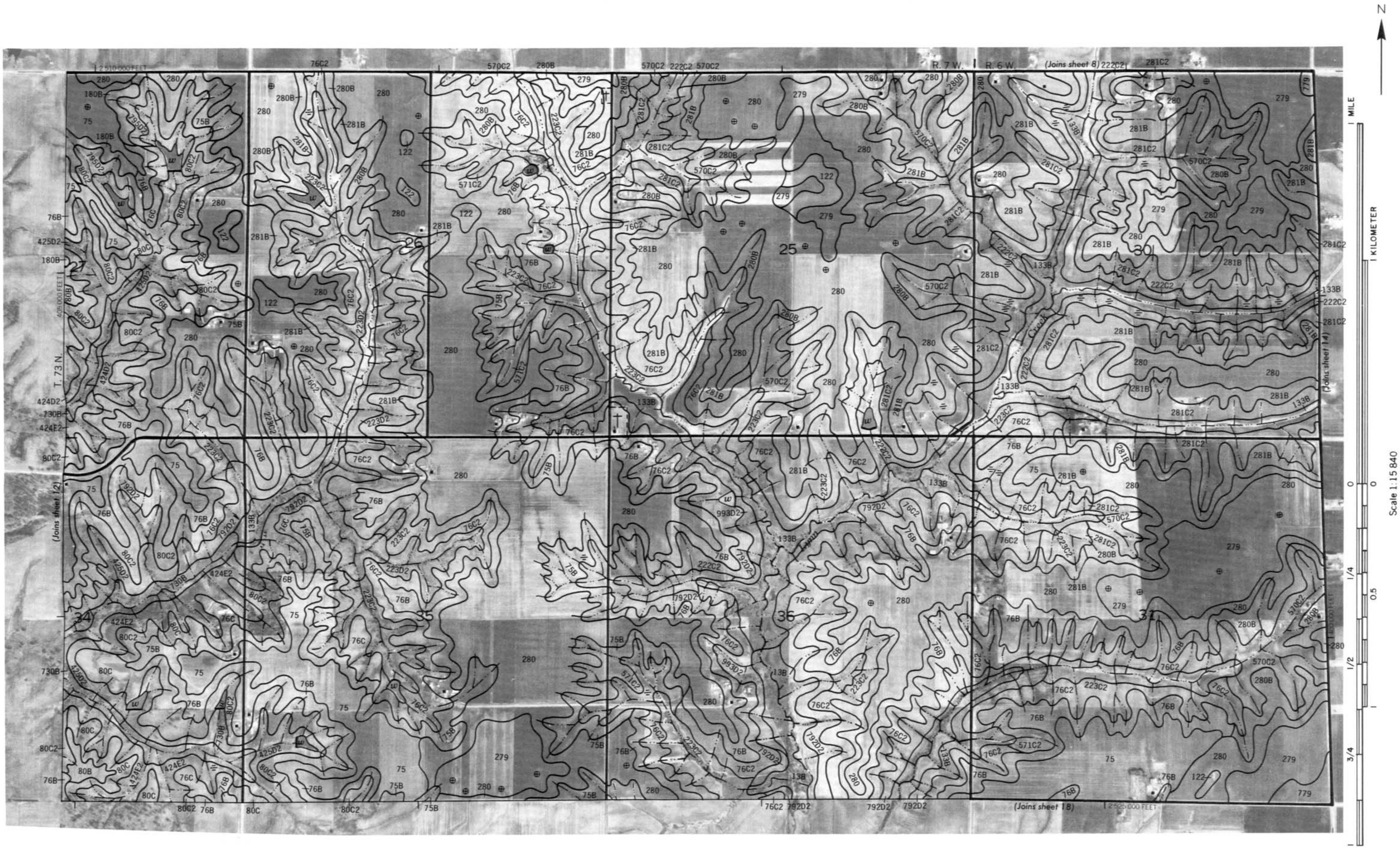
1/2

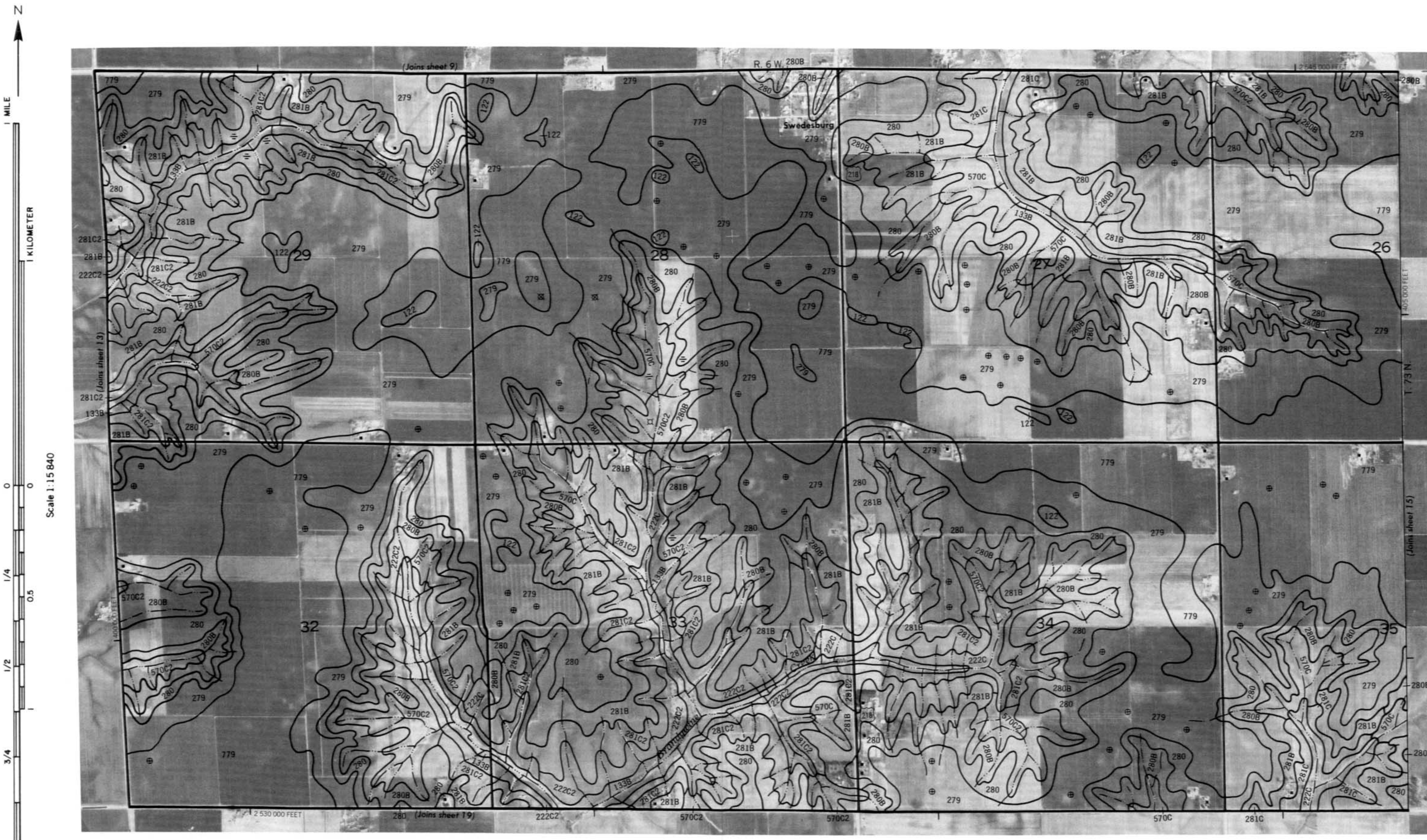
1

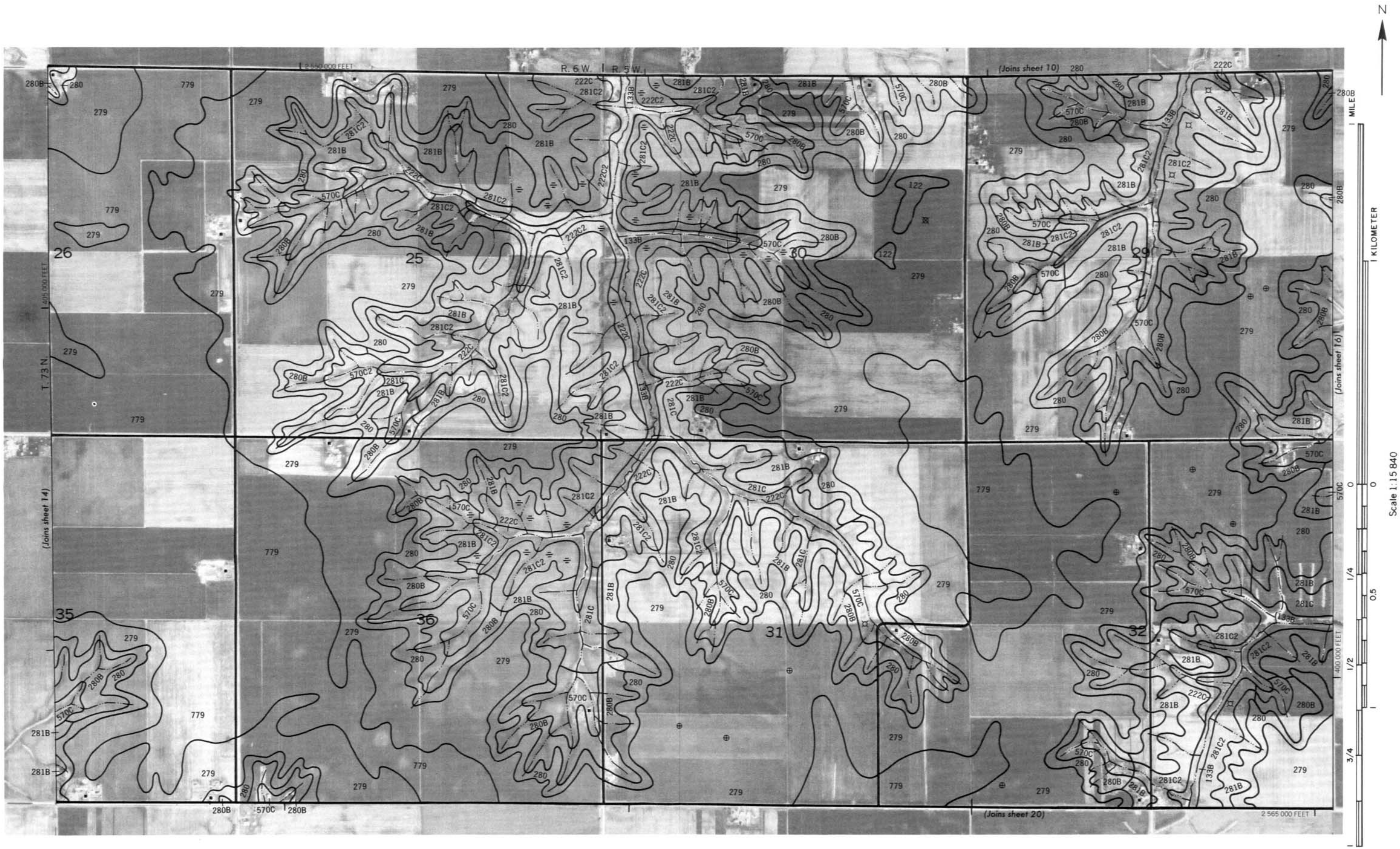
3/4

1

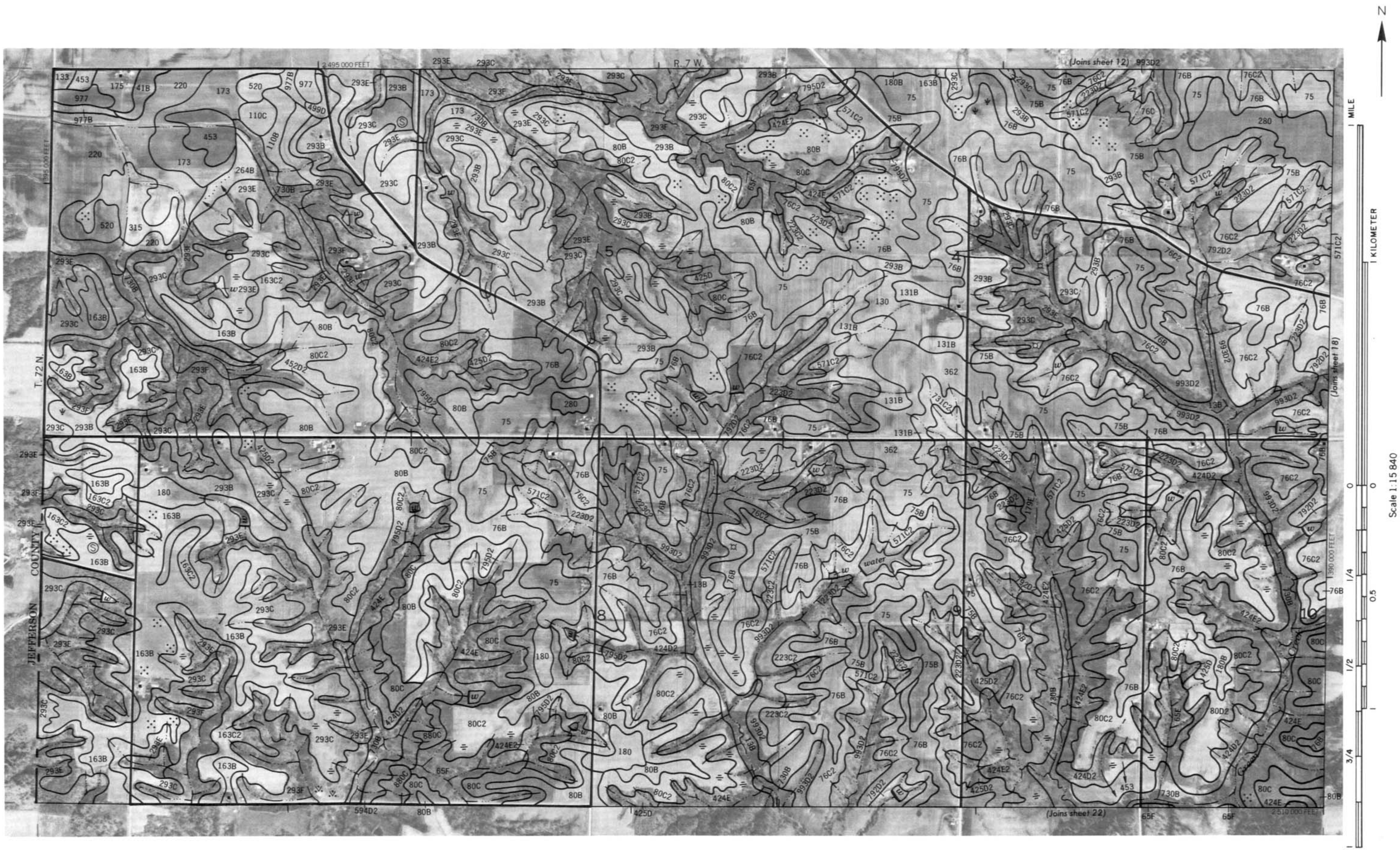



13
N
R. 7 W.
R. 6 W.
T. 73 N.
(Joins sheet 8)
(Joins sheet 14)
(Joins sheet 12)
(Joins sheet 18)
2 510 000 FEET
2 525 000 FEET
25
26
27
30
31
34
35
36
Crook
1 MILE
1 KILOMETER
Scale 1:15 840


N
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
1
0.5
(Joins sheet 9)
R. 6 W.
Swedesburg
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 19)
T. 73 N.
2 530 000 FEET
29
28
27
26
32
33
34
35


N
R. 6 W.
R. 5 W.
2 550 000 FEET
2 565 000 FEET
405 000 FEET
400 000 FEET
(Joins sheet 10)
(Joins sheet 14)
(Joins sheet 16)
(Joins sheet 20)
T. 73 N.
26
25
30
29
35
36
31
32
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
1

HENRY COUNTY, IOWA — SHEET NUMBER 16


N
(Joins sheet 12)
(Joins sheet 18)
(Joins sheet 22)
R. 7 W.
T. 72 N.
JEFFERSON COUNTY
2 495 000 FEET
2 510 000 FEET
395 000 FEET
390 000 FEET
water
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

N

1 MILE

1 KILOMETER

Scale 1:15 840

0 0

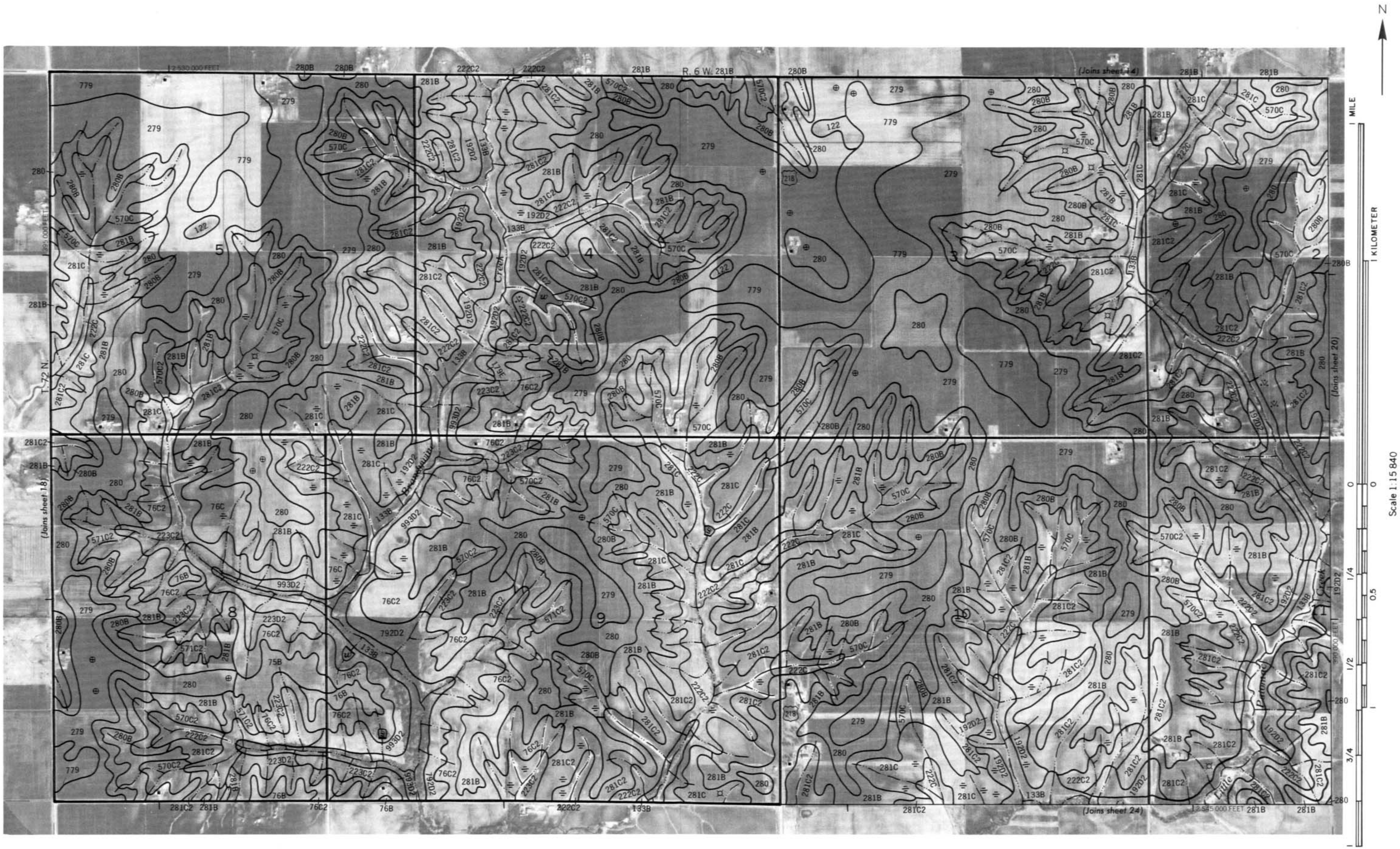
1/4

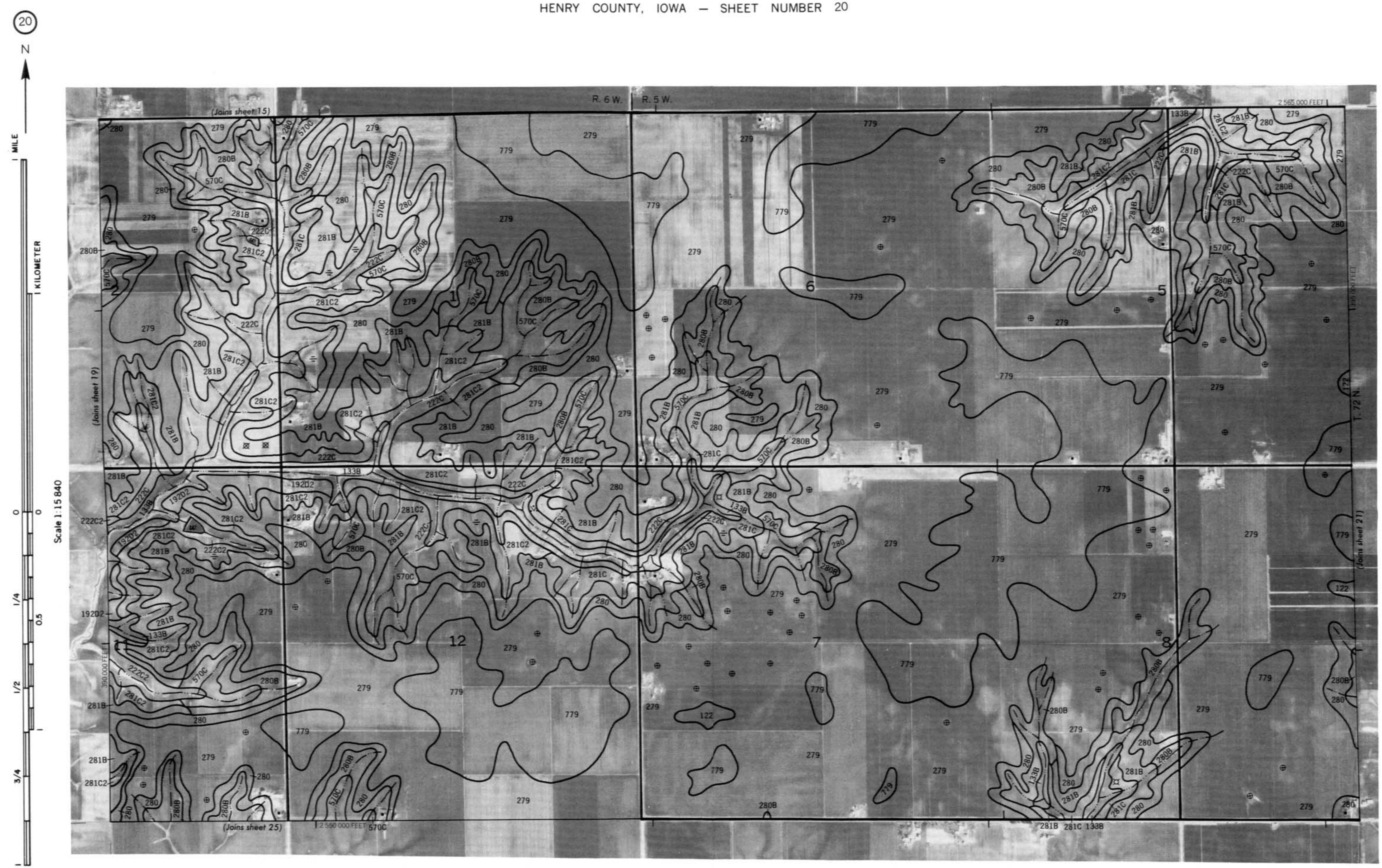
0.5

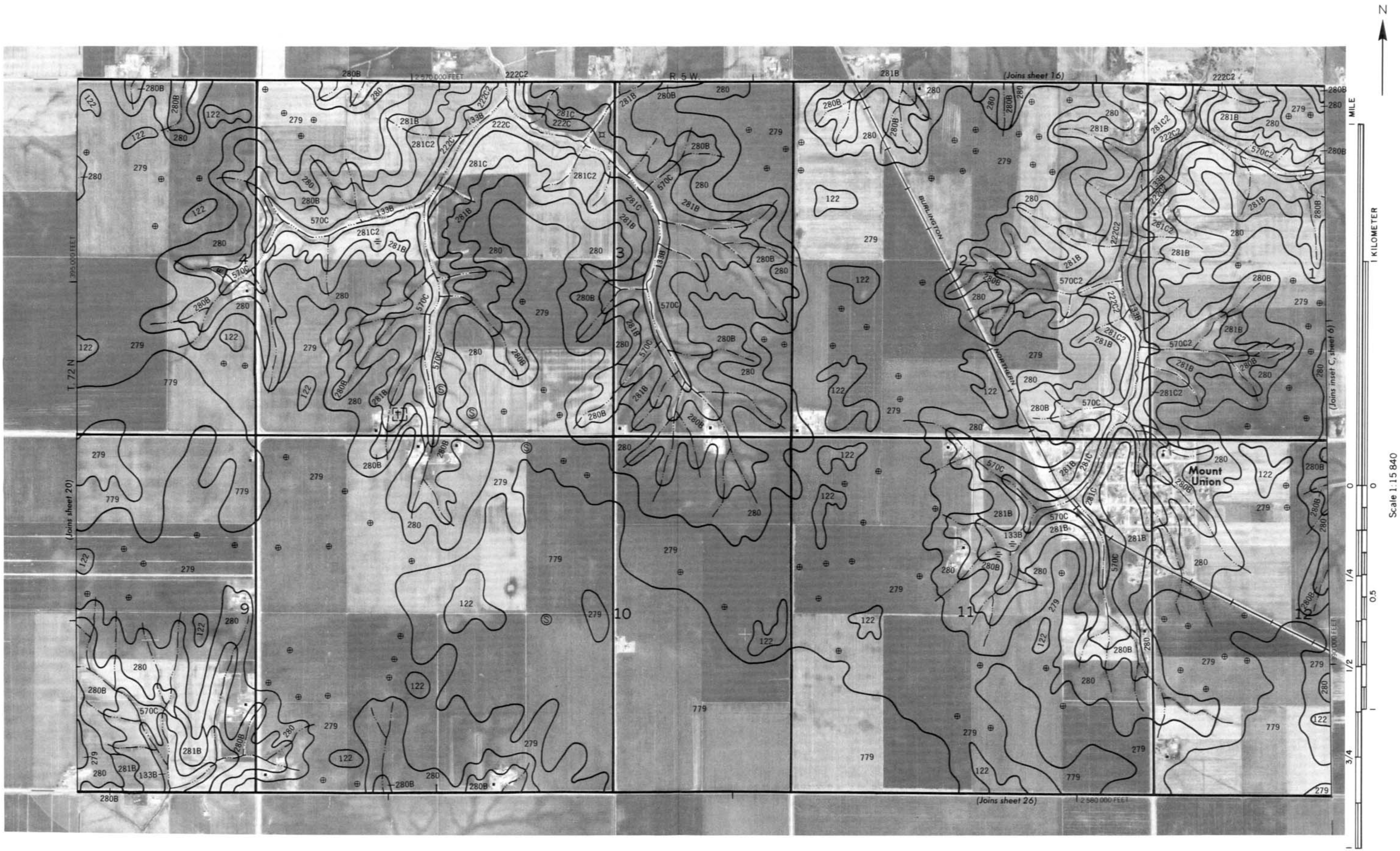
1/2

1

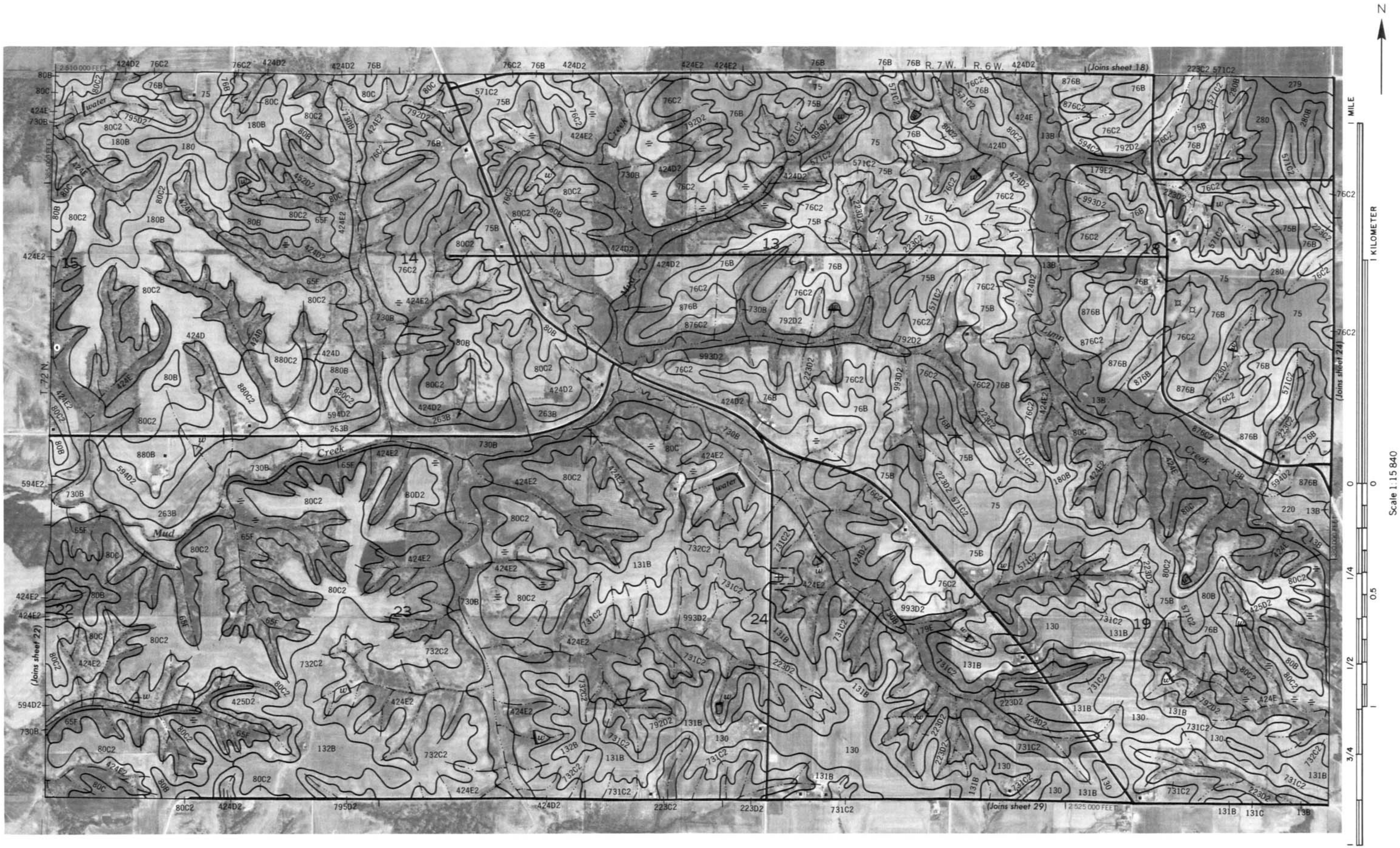
3/4

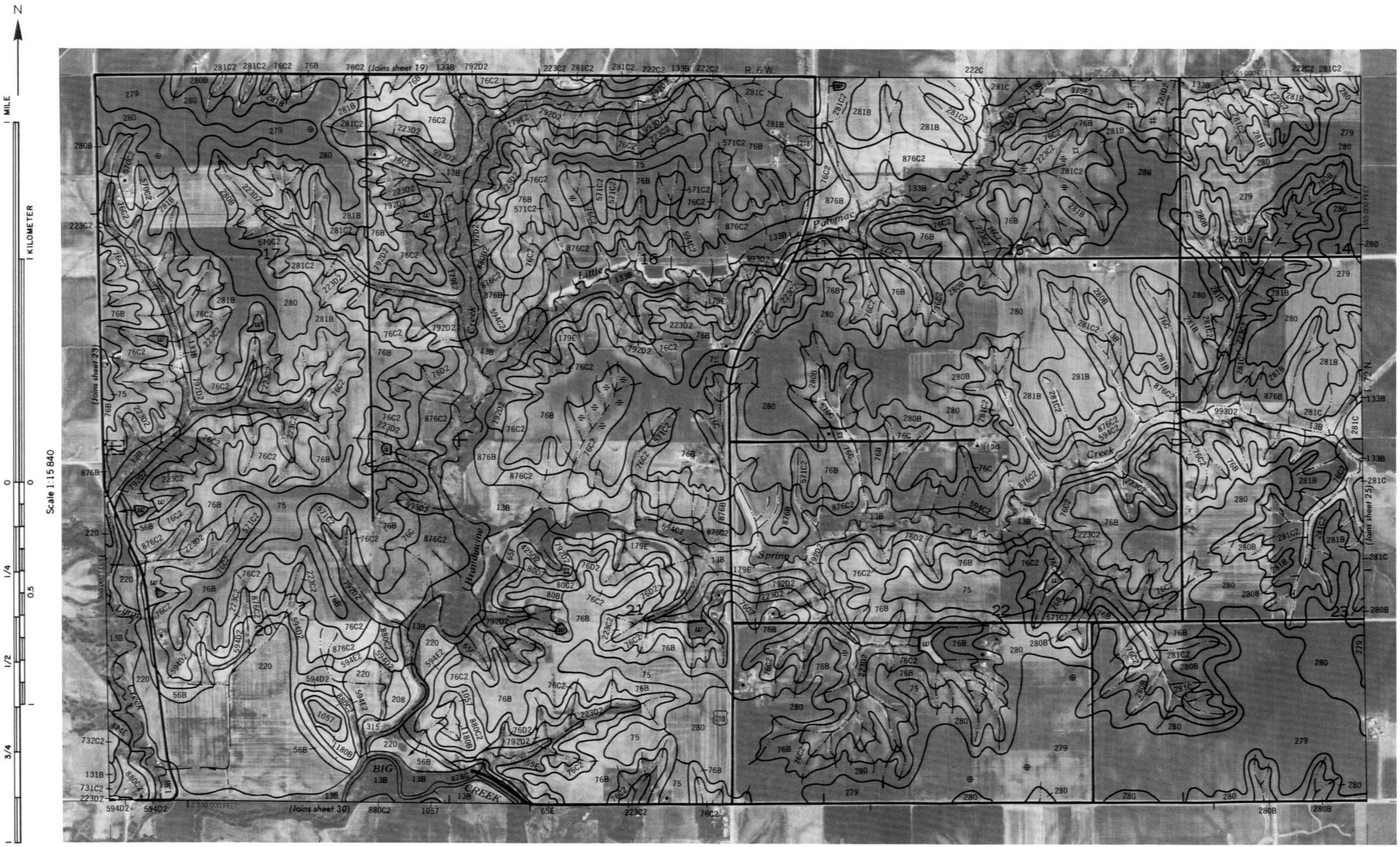

N
R. 6 W.
T. 72 N.
(Joins sheet 14)
(Joins sheet 20)
(Joins sheet 24)
(Joins sheet 18)
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
2 530 000 FEET
2 545 000 FEET
Crooked Creek
Little Crooked Creek

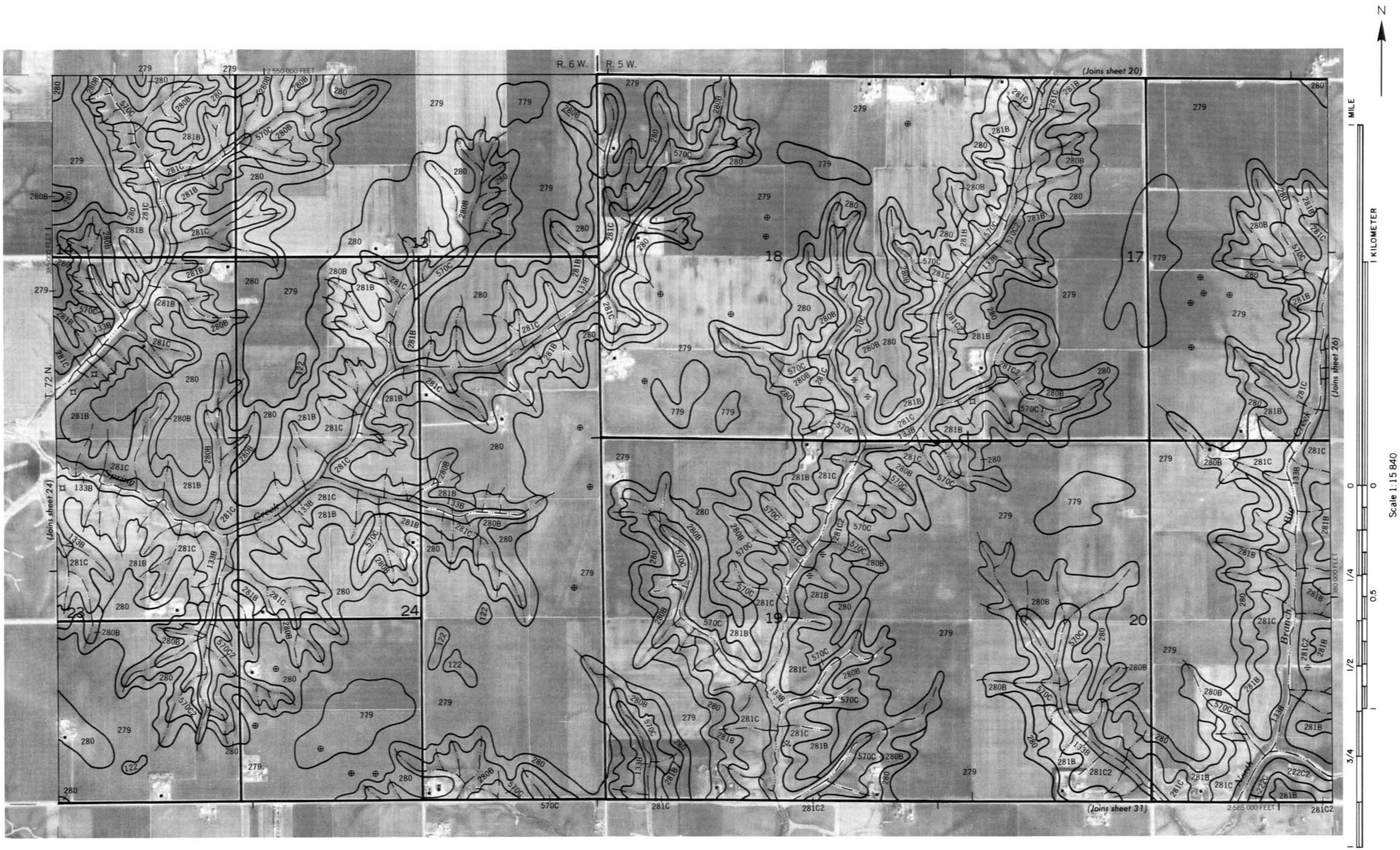

20
N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
0.5
1/2
3/4
R. 6 W.
R. 5 W.
(Joins sheet 15)
(Joins sheet 19)
(Joins sheet 21)
(Joins sheet 25)
2 565 000 FEET
2 550 000 FEET
390 000 FEET
T. 72 N.

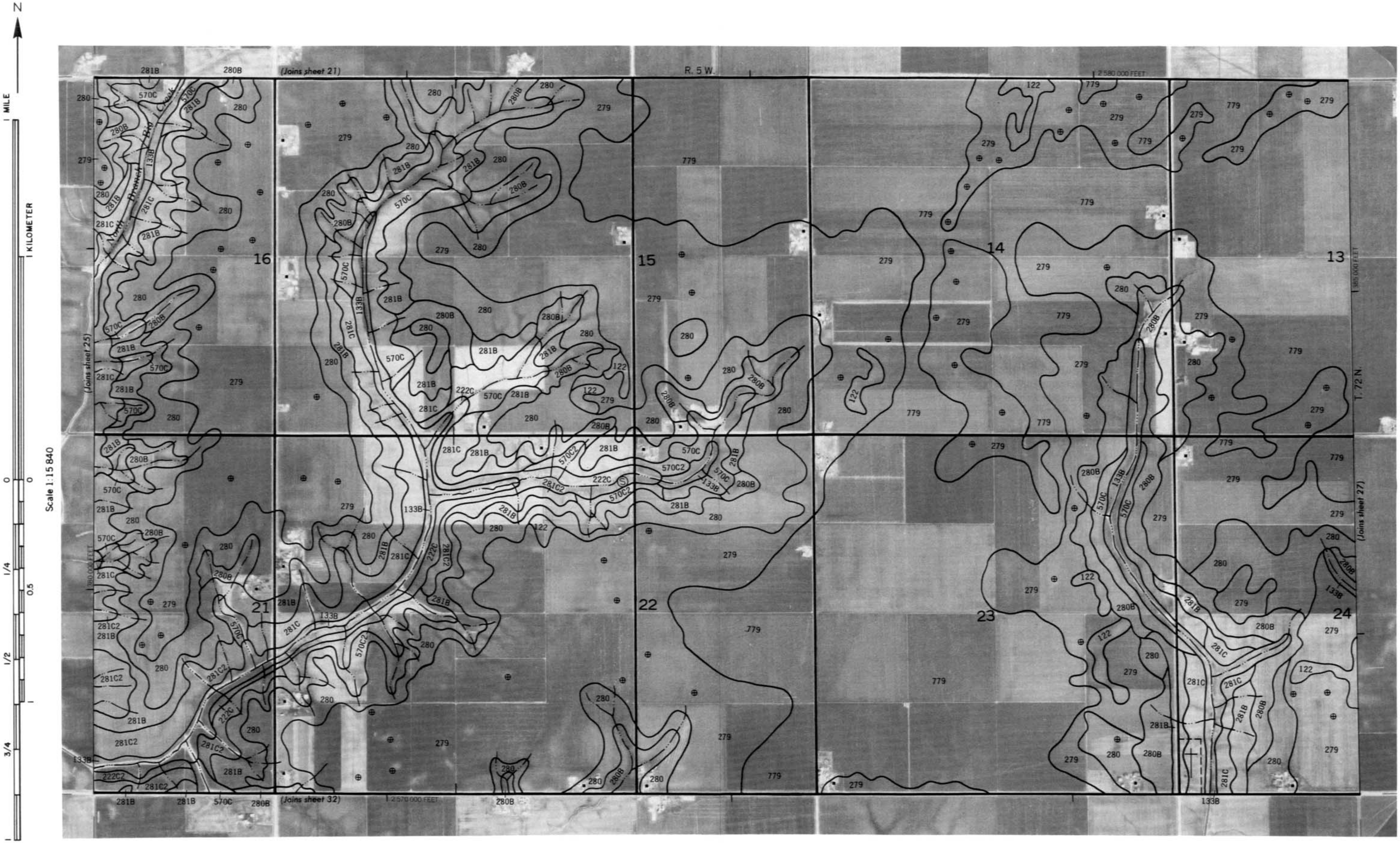

N
(Joins sheet 16)
(Joins sheet 20)
(Joins sheet 26)
(Joins inset C, sheet 6)
R. 5 W.
T. 72 N.
2 570 000 FEET
2 580 000 FEET
395 000 FEET
BURLINGTON
NORTHERN
Mount Union
1
2
3
4
9
10
11
12
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
280B
280
279
779
122
281B
281C
281C2
222C
222C2
133B
570C
570C2

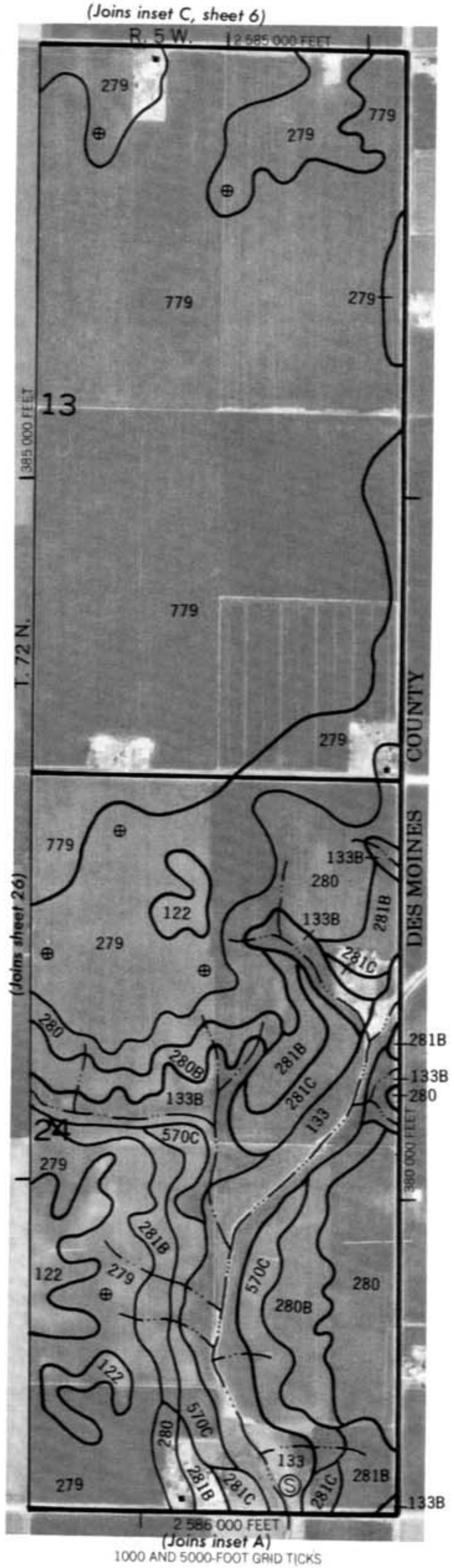

22
N
MILE
KILOMETER
Scale 1:15 840
(Joins sheet 17)
R. 7 W.
2 510 000 FEET
T. 72 N.
(Joins sheet 23)
(Joins sheet 28)
2 495 000 FEET
380 000 FEET
JEFFERSON COUNTY
SKUNK
RIVER
Creek
Mud
18
17
16
15
19
20
21
22
33

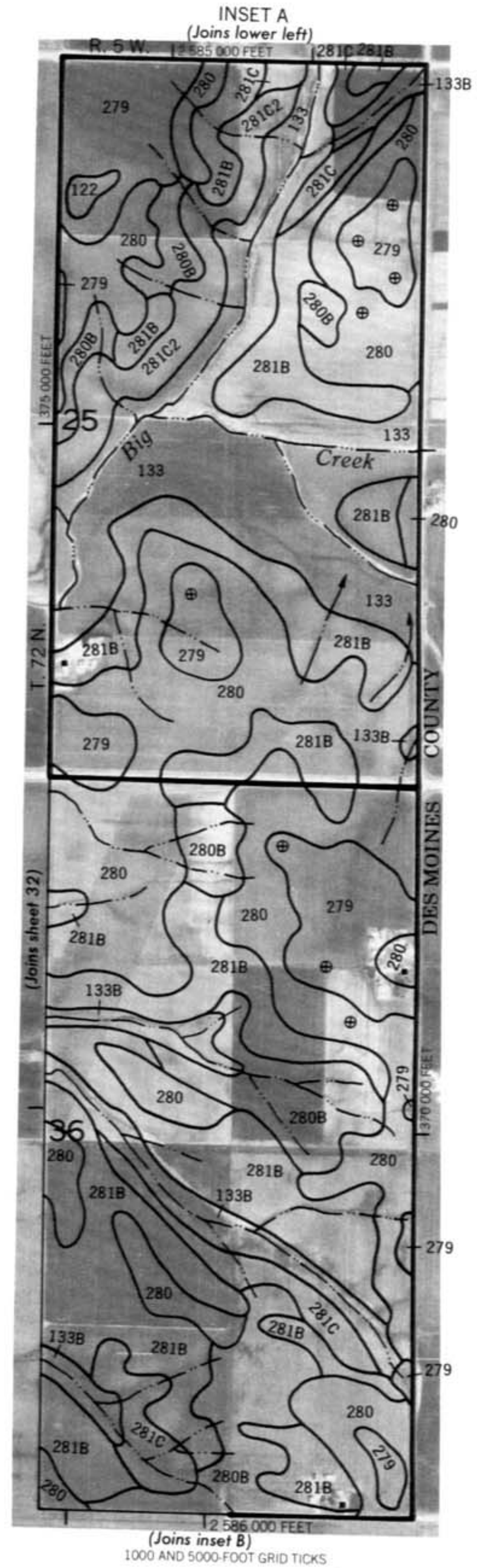

23
N
(Joins sheet 18)
(Joins sheet 24)
(Joins sheet 29)
(Joins sheet 22)
R. 7 W.
R. 6 W.
T. 72 N.
2 510 000 FEET
2 525 000 FEET
Mud Creek
Lynn Creek
Creek
water
13
14
15
18
19
22
23
24
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

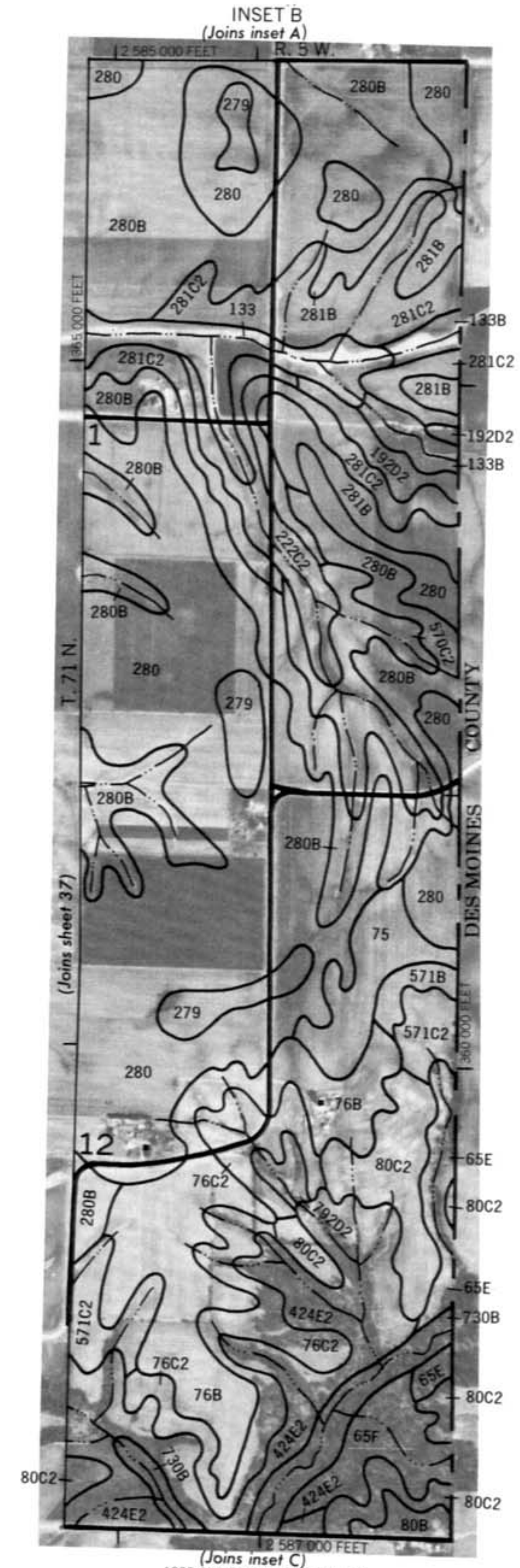

N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
(Joins sheet 19)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 30)
R. 6 W.
T. 72 N.
Little
Creek
Potomac
Creek
Brandywine
Creek
Spring
Creek
Lynn
Creek
BIG
CREEK
17
16
15
14
20
21
22
23
218

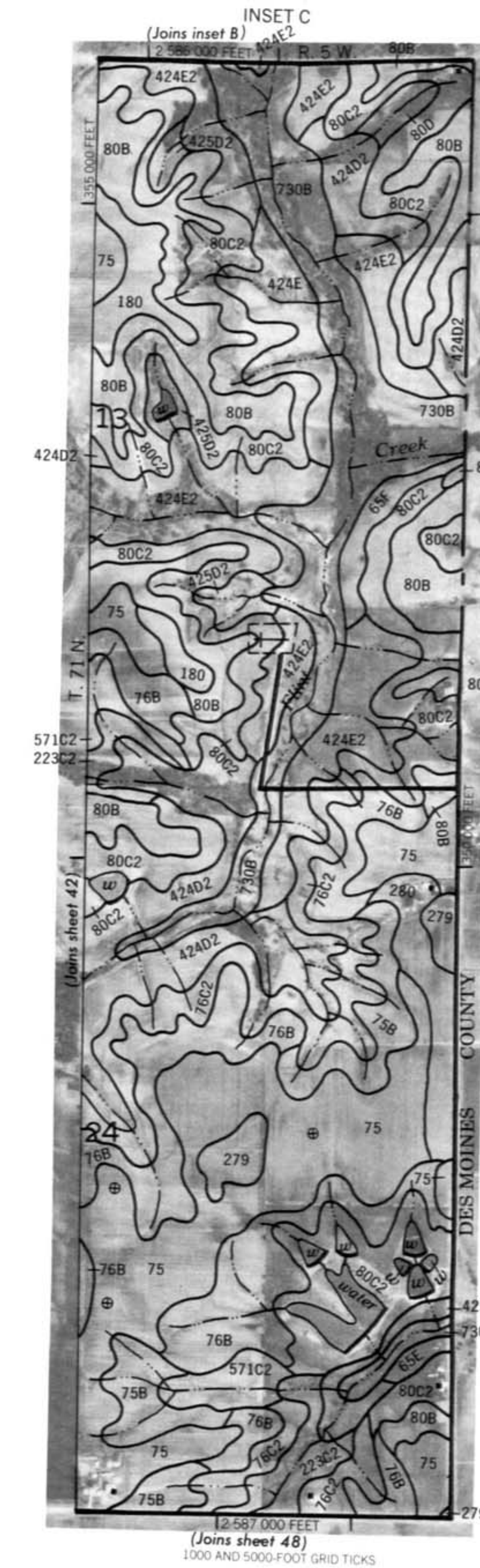

N
R. 6 W.
R. 5 W.
(Joins sheet 20)
(Joins sheet 26)
(Joins sheet 31)
(Joins sheet 24)
T. 72 N.
2 550 000 FEET
2 565 000 FEET
380 000 FEET
14
13
18
17
23
24
19
20
Spring
Creek
Big
Creek
North
Branch
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

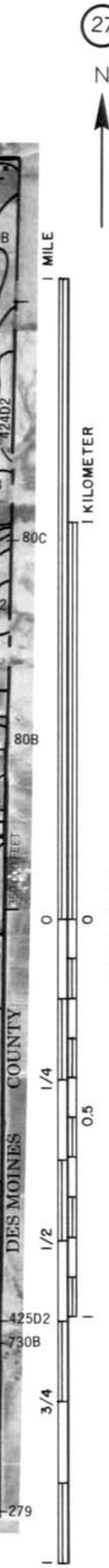

N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840
(Joins sheet 21)
R. 5 W.
2 580 000 FEET
(Joins sheet 25)
(Joins sheet 27)
(Joins sheet 32)
2 570 000 FEET
385 000 FEET
380 000 FEET
T. 72 N.
North Branch Big Creek
16
15
14
13
21
22
23
24
279
280
280B
281B
281C
281C2
570C
570C2
133B
222C
222C2
122
779


(Joins inset C, sheet 6)
R. 5 W.
2 585 000 FEET
T. 72 N.
385 000 FEET
380 000 FEET
(Joins sheet 26)
DES MOINES COUNTY
13
24
Big
2 586 000 FEET
(Joins inset A)
1000 AND 5000-FOOT GRID TICKS

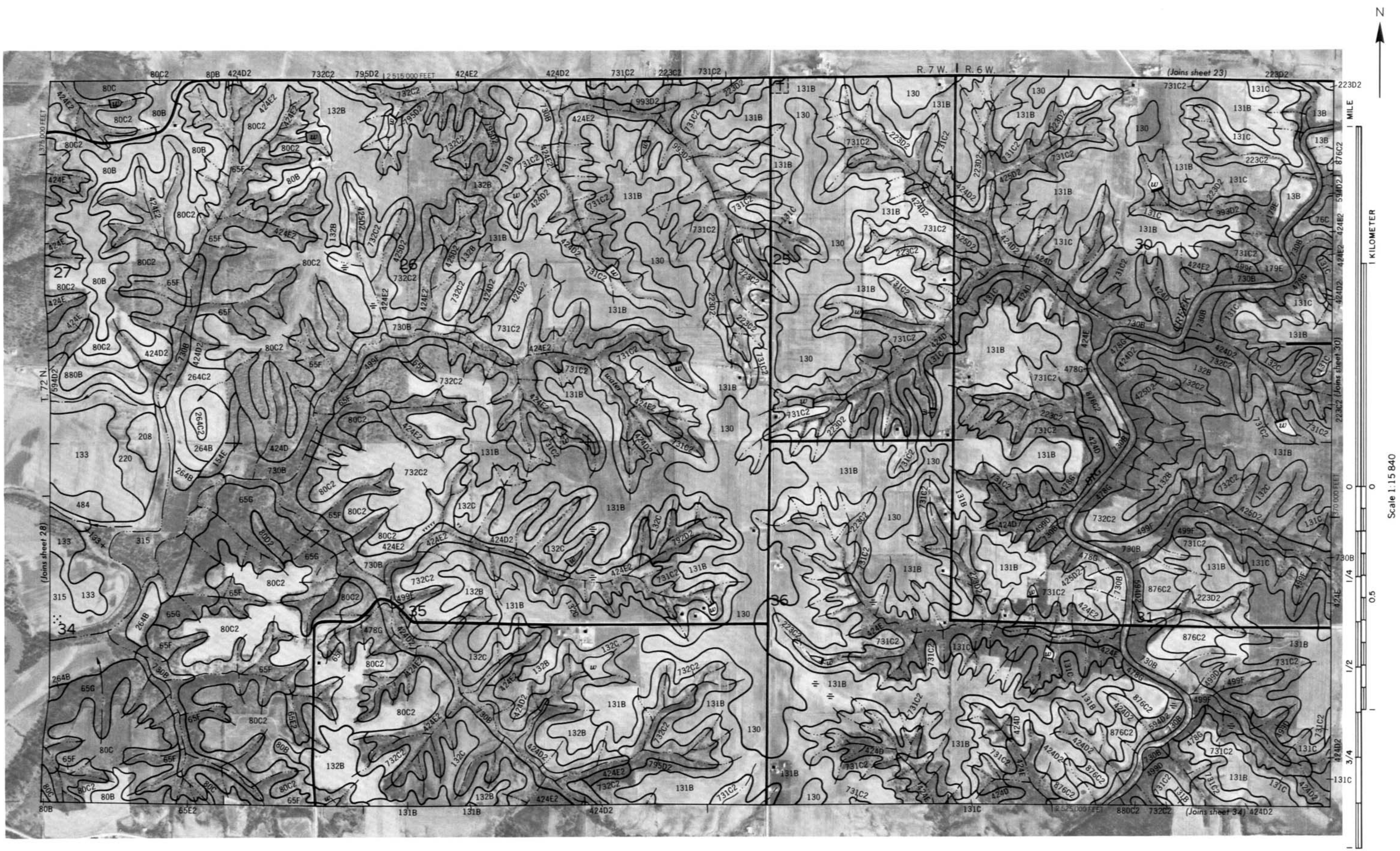

INSET A
(Joins lower left)
R. 5 W.
2 585 000 FEET
T. 72 N.
375 000 FEET
370 000 FEET
(Joins sheet 32)
DES MOINES COUNTY
25
36
Big Creek
2 586 000 FEET
(Joins inset B)
1000 AND 5000-FOOT GRID TICKS

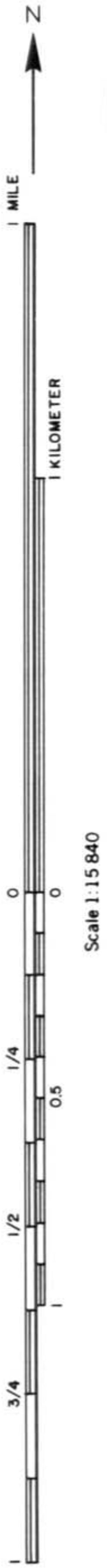

INSET B
(Joins inset A)
R. 5 W.
2 585 000 FEET
T. 71 N.
365 000 FEET
360 000 FEET
(Joins sheet 37)
DES MOINES COUNTY
1
12
2 587 000 FEET
(Joins inset C)
1000 AND 5000-FOOT GRID TICKS


INSET C
(Joins inset B)
R. 5 W.
2 586 000 FEET
T. 71 N.
355 000 FEET
(Joins sheet 42)
DES MOINES COUNTY
13
24
Creek
water
2 587 000 FEET
(Joins sheet 48)
1000 AND 5000-FOOT GRID TICKS

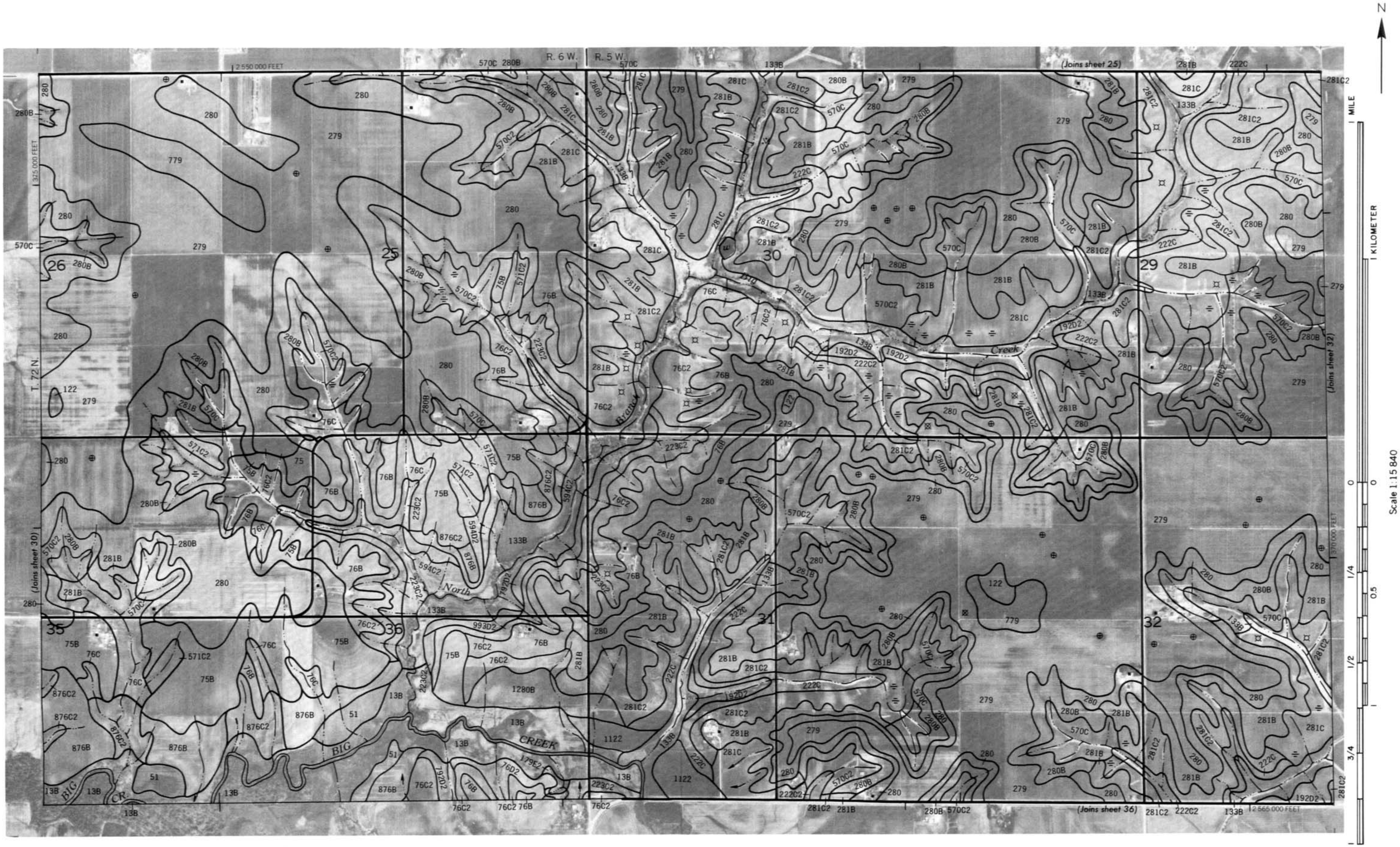

27
N
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

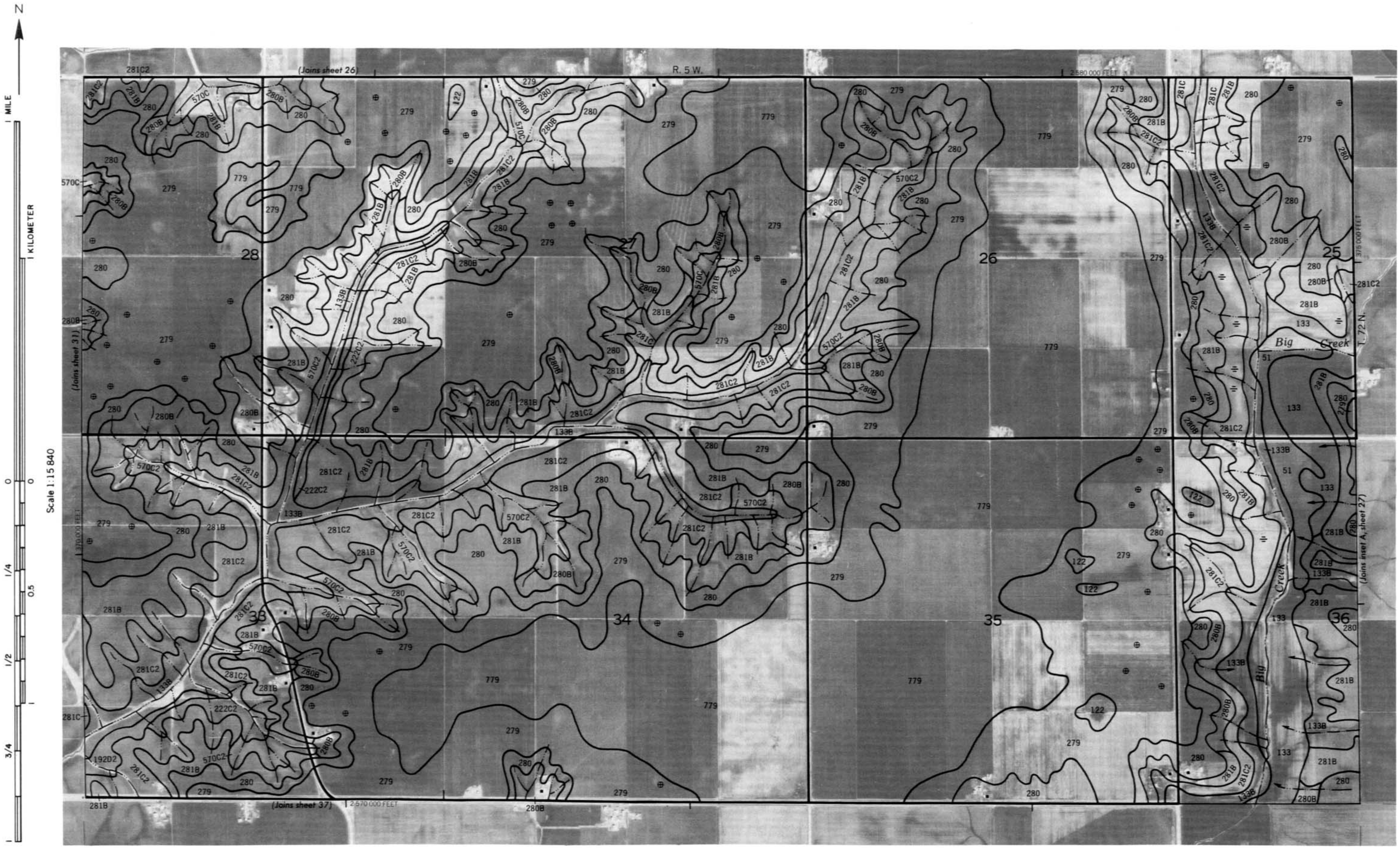

28
N
1 MILE
1 KILOMETER
Scale 1:15 840
(Joins sheet 22)
R. 7 W.
JEFFERSON COUNTY
SKUNK RIVER
SKUNK
RIVER
Mud Creek
T. 72 N.
(Joins sheet 29)
(Joins sheet 33)
water
29
28
27
30
31
32
33
34

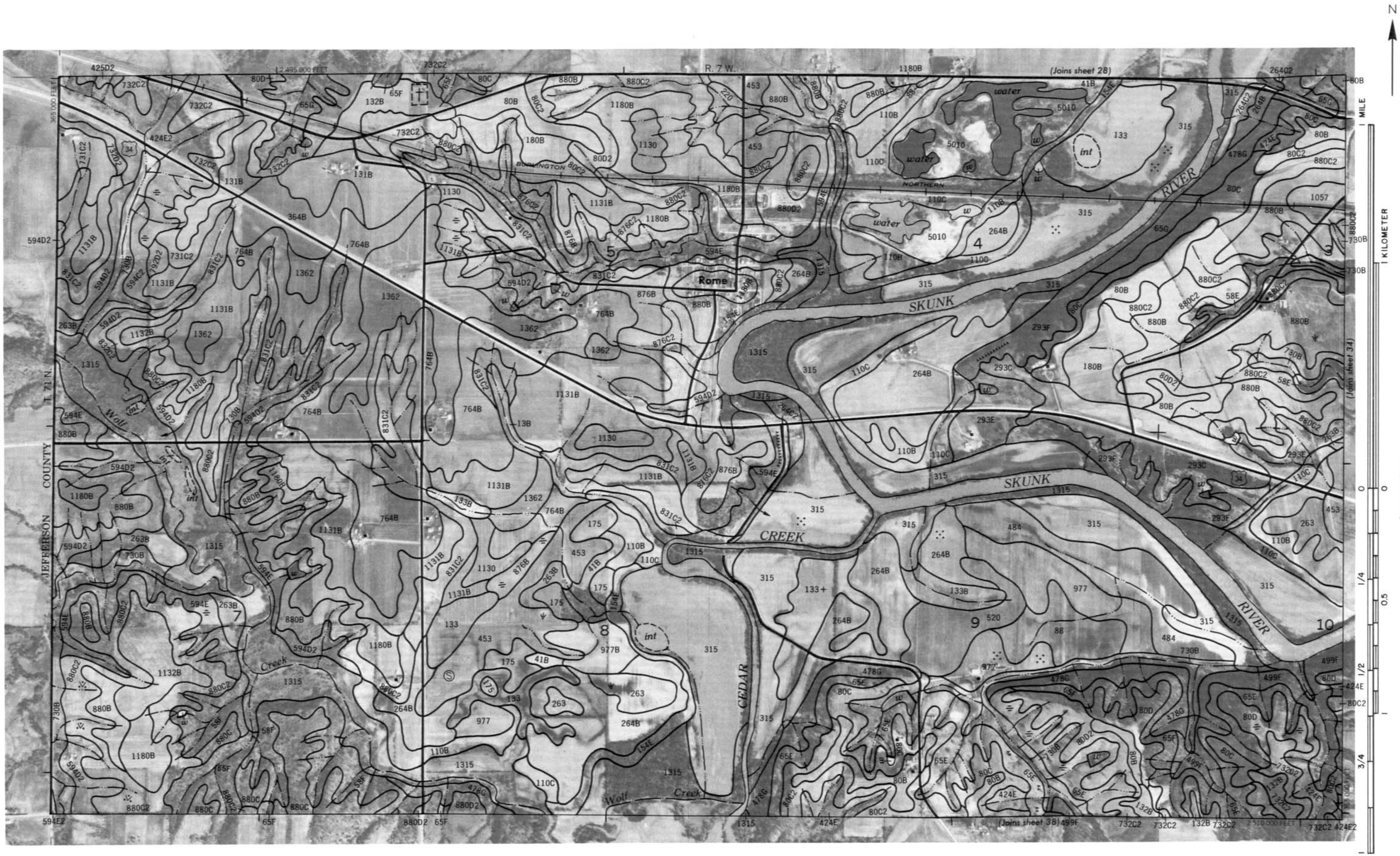

N
(Joins sheet 23)
(Joins sheet 28)
(Joins sheet 30)
(Joins sheet 34)
R. 7 W.
R. 6 W.
T. 72 N.
1 MILE
1 KILOMETER
Scale 1:15 840


N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
1


(Joins sheet 24)
R. 6 W.
2 545 000 FEET
375 000 FEET
T. 72 N.
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 35)
370 000 FEET
2 530 000 FEET
BIG CREEK
26
27
28
29
32
33
34
35

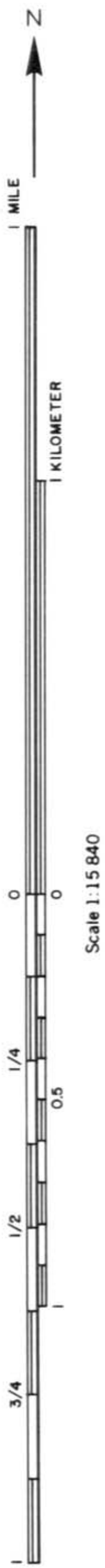

N
R. 6 W.
R. 5 W.
2 550 000 FEET
325 000 FEET
370 000 FEET
2 565 000 FEET
(Joins sheet 25)
(Joins sheet 30)
(Joins sheet 32)
(Joins sheet 36)
T. 72 N.
25
26
29
30
31
32
35
36
Big
Branch
Creek
North
BIG
CREEK
BIG
CR.
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

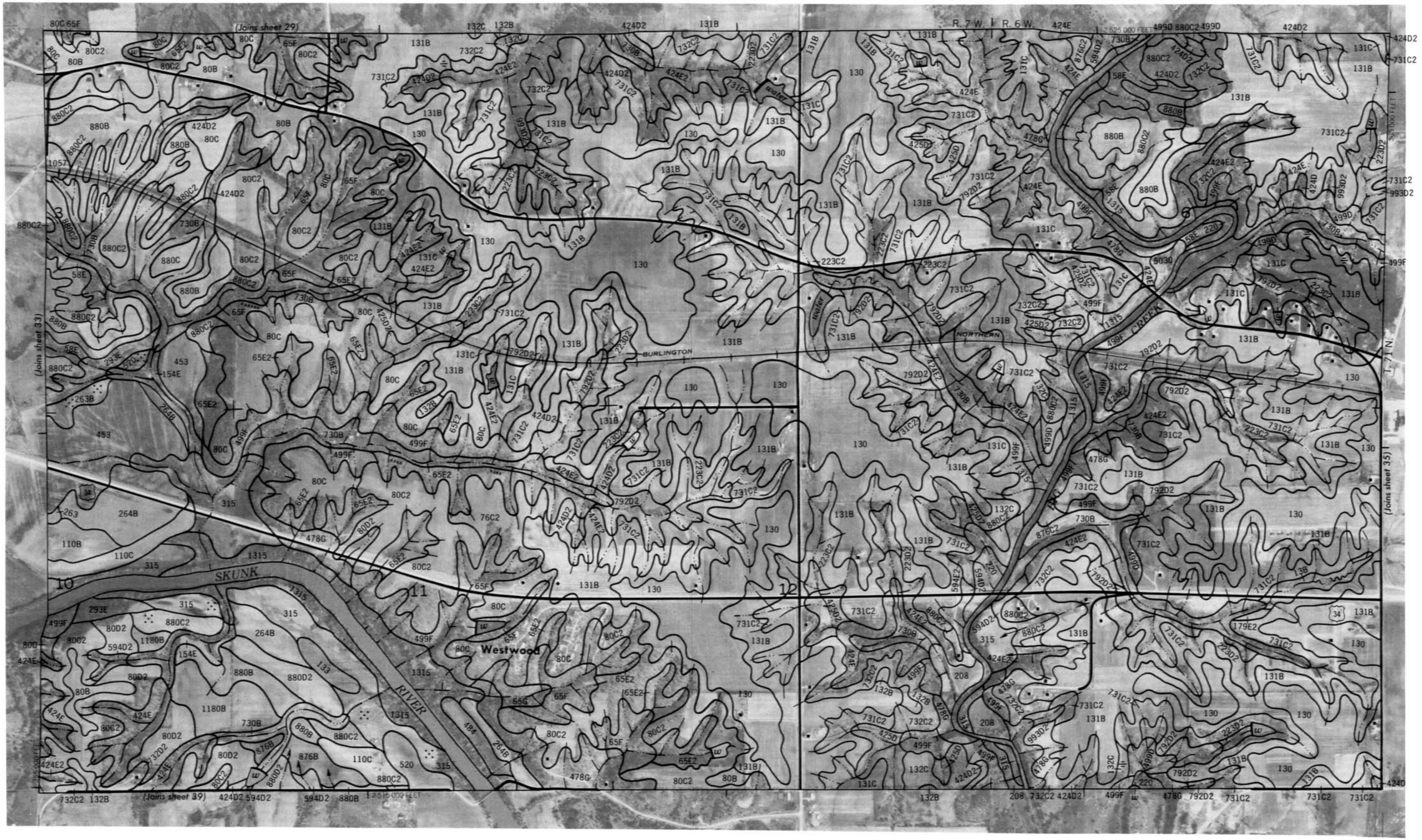

N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
(Joins sheet 26)
R. 5 W.
2 580 000 FEET
(Joins sheet 31)
(Joins sheet 37)
2 570 000 FEET
(Joins inset A, sheet 27)
T. 72 N.
375 000 FEET
370 000 FEET
28
27
26
25
33
34
35
36
Big Creek
Big Creek


N
(Joins sheet 28)
(Joins sheet 34)
(Joins sheet 38)
R. 7 W.
T. 71 N.
JEFFERSON COUNTY
2 495 000 FEET
2 510 000 FEET
368 000 FEET
Rome
BURLINGTON
NORTHERN
SKUNK
RIVER
SKUNK
RIVER
CEDAR
CREEK
Wolf
Creek
Wolf
Creek
water
water
water
int
1 MILE
1 KILOMETER
Scale 1:15 840

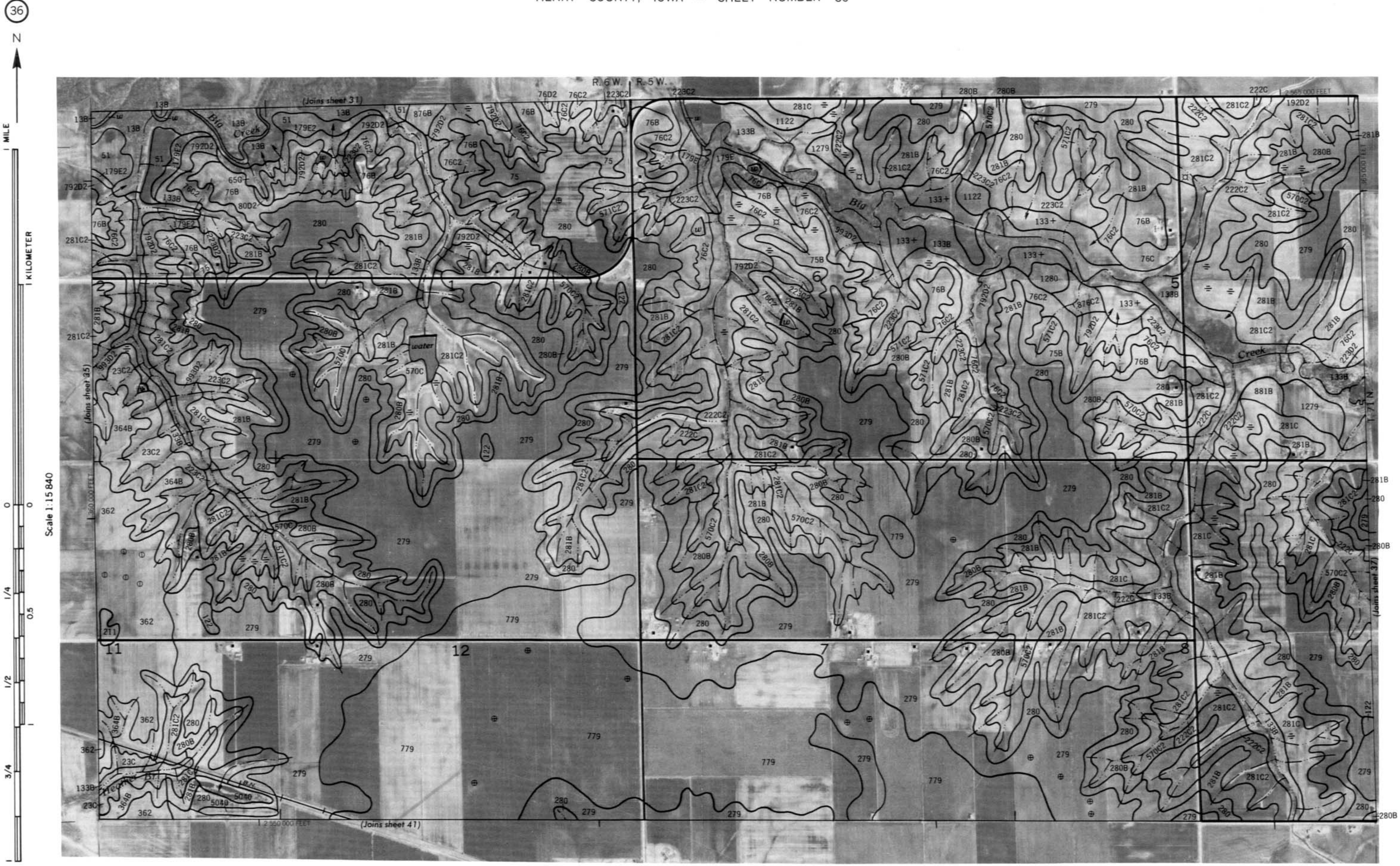
34

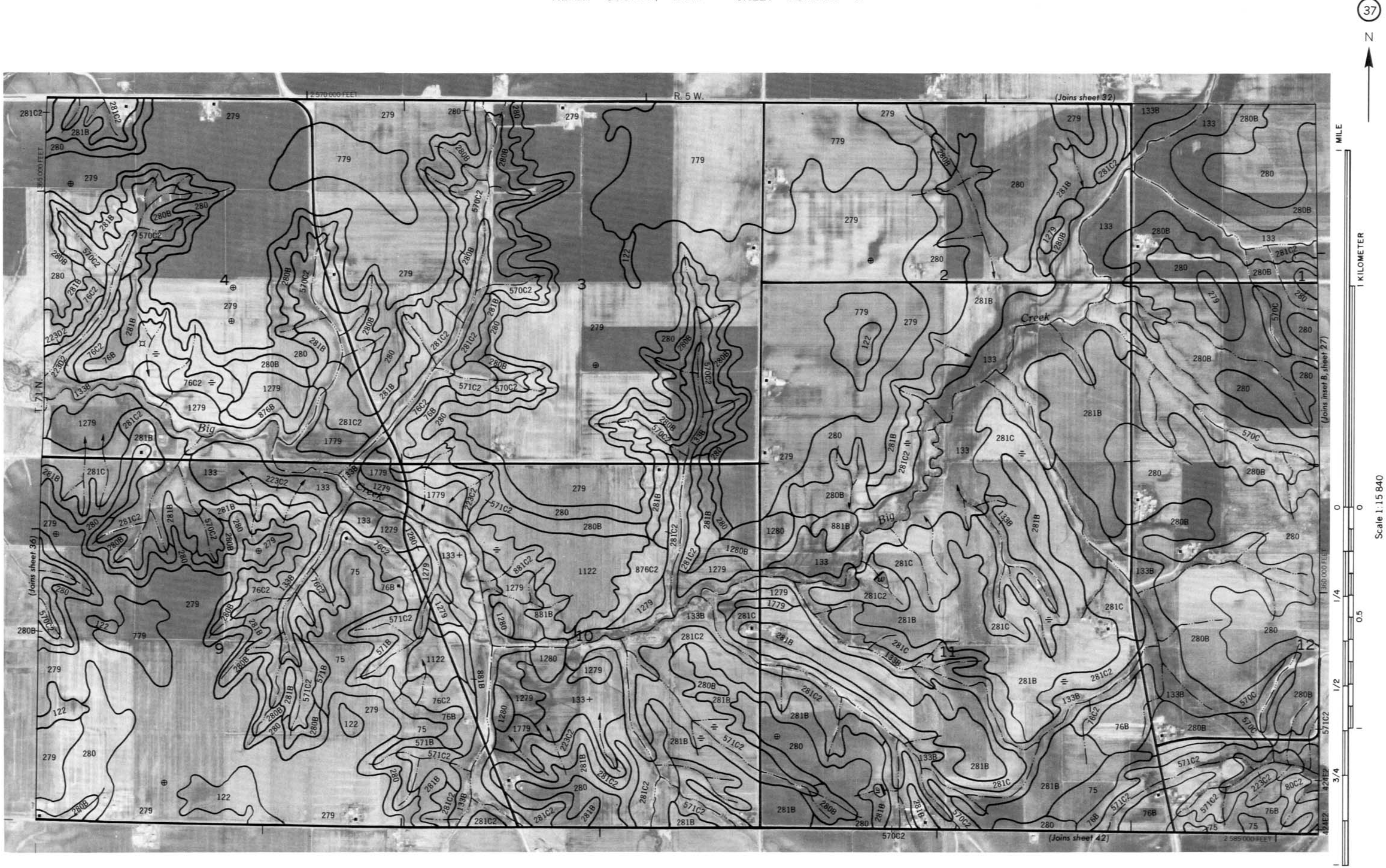
HENRY COUNTY, IOWA — SHEET NUMBER 34

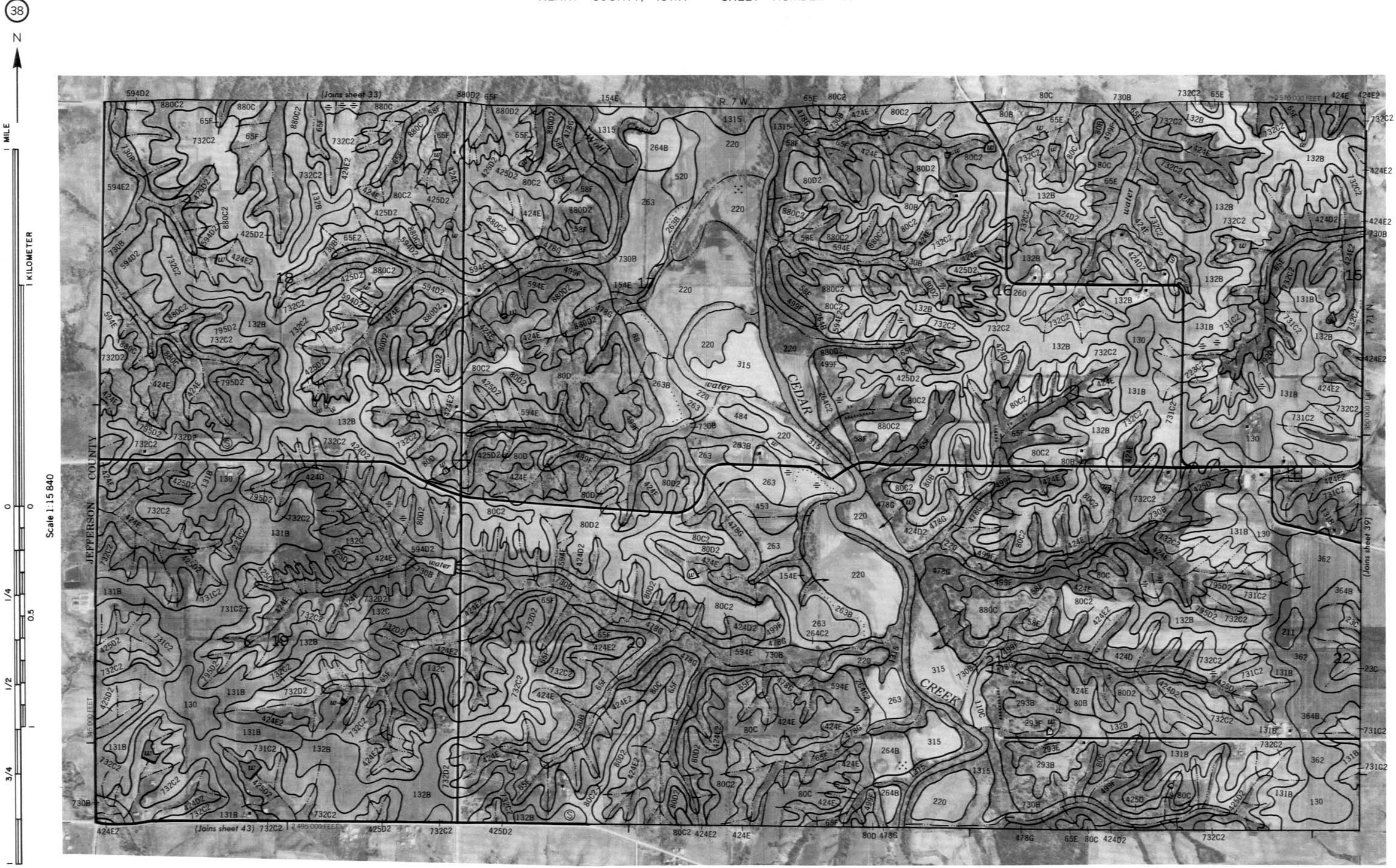




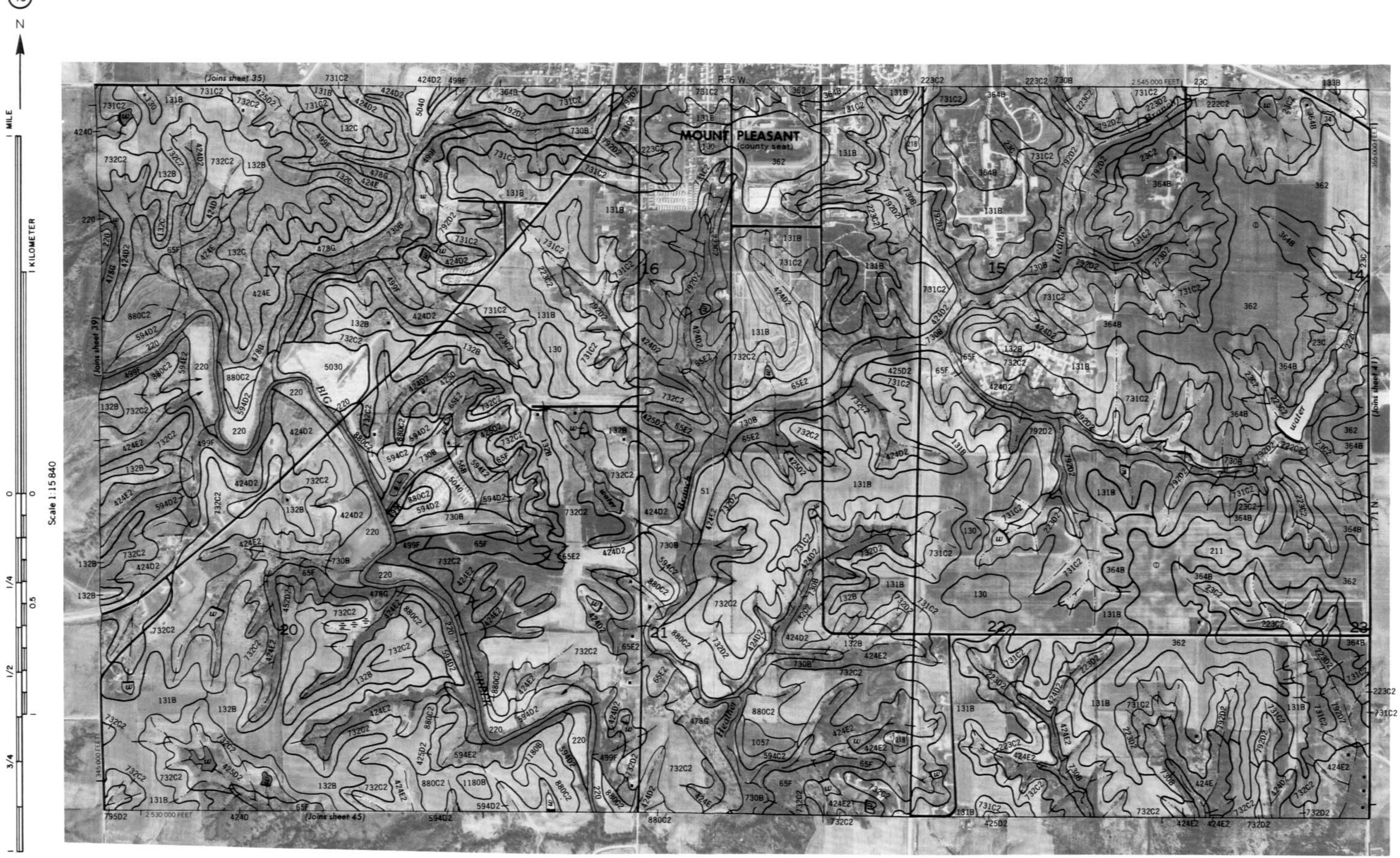

N
R. 6 W.
T. 71 N.
(Joins sheet 30)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 40)
2 530 000 FEET
2 545 000 FEET
560 000 FEET
MOUNT PLEASANT
(county seat)
BURLINGTON
NORTHERN
1 MILE
1 KILOMETER
Scale 1:15 840

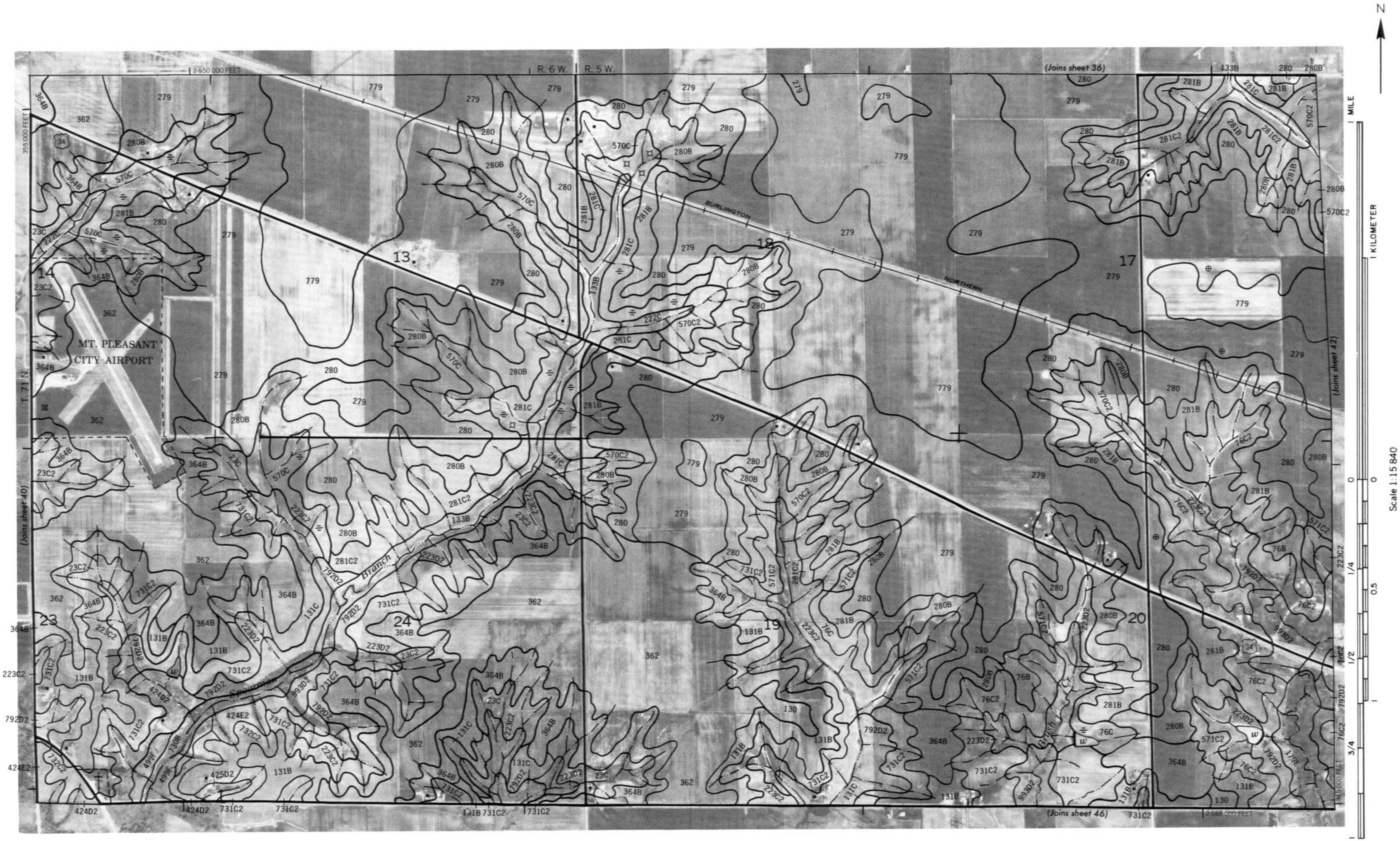

36
N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
1
R. 6 W.
R. 5 W.
(Joins sheet 31)
(Joins sheet 35)
(Joins sheet 37)
(Joins sheet 41)
Big Creek
Big
Creek
water
T. 71 N.
2 550 000 FEET
2 565 000 FEET
360 000 FEET
1
6
5
11
12
7
8

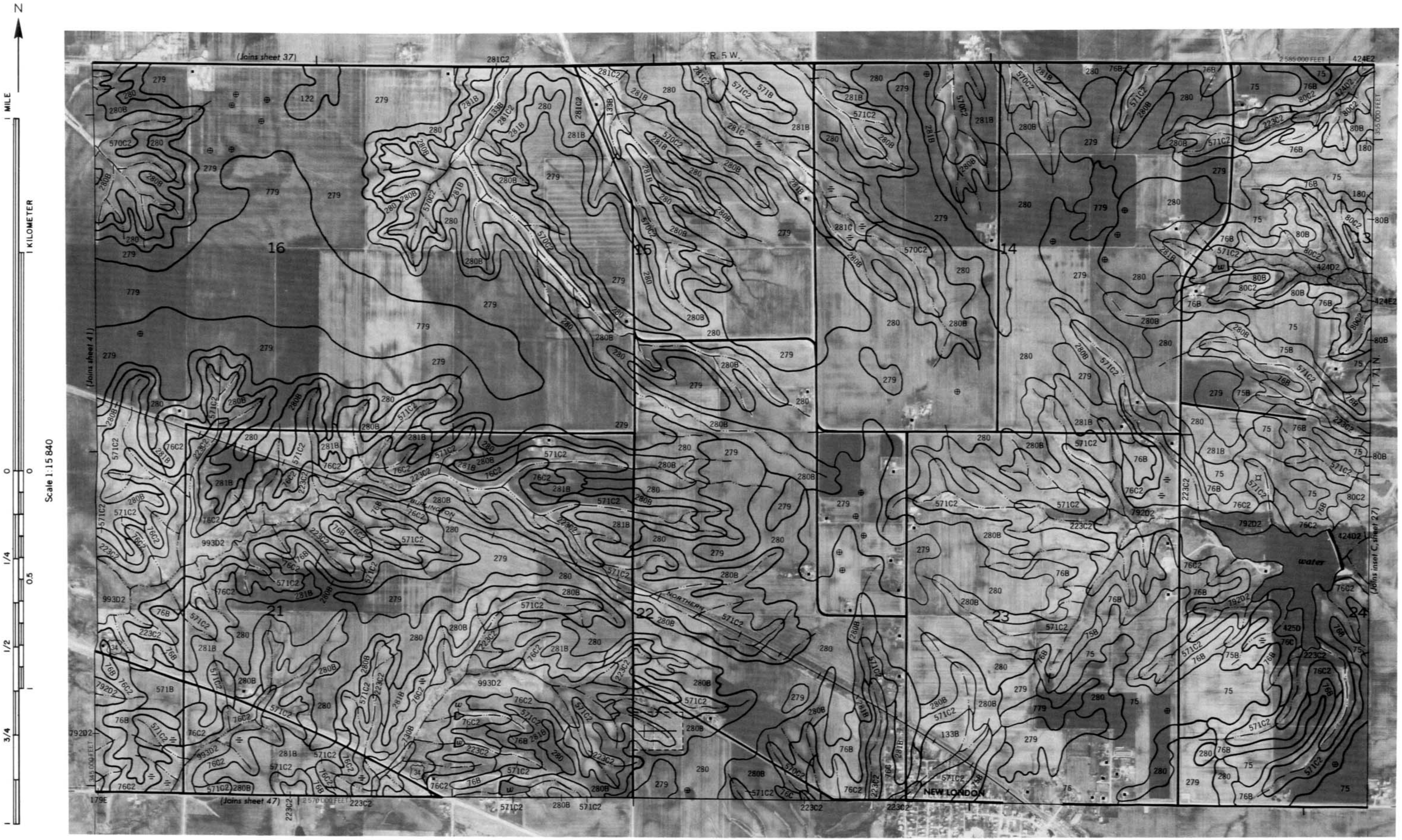

37
N
R. 5 W.
(Joins sheet 32)
(Joins sheet 42)
(Joins sheet 36)
(Joins inset B, sheet 27)
T. 71 N.
2 570 000 FEET
2 585 000 FEET
355 000 FEET
360 000 FEET
Big Creek
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

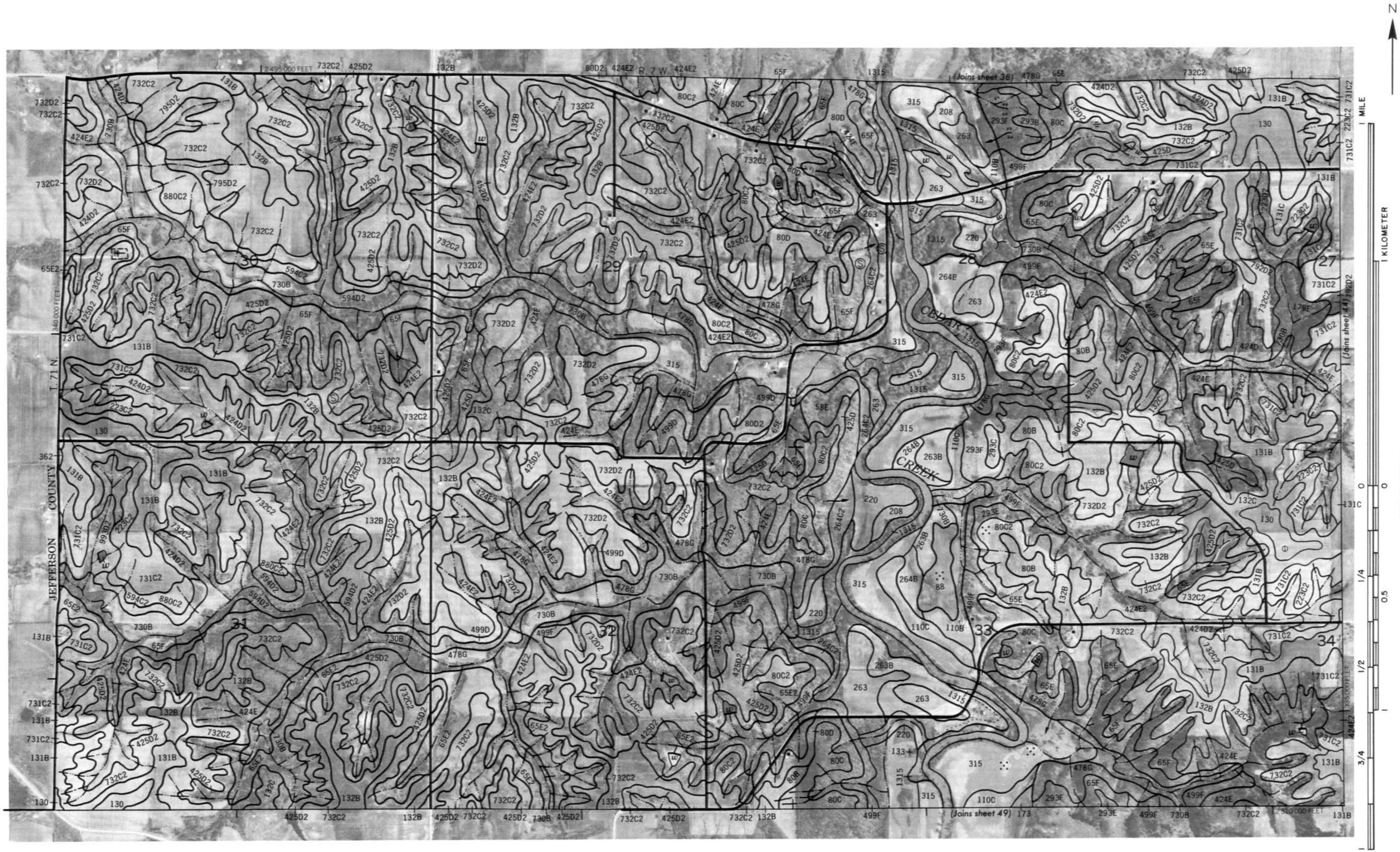

38
N
MILE
KILOMETER
Scale 1:15 840
(Joins sheet 33)
(Joins sheet 43)
(Joins sheet 39)
R. 7 W.
T. 71 N.
JEFFERSON COUNTY
CEDAR
CREEK
Wolf
water
15
16
17
18
19
20
21
22
2 495 000 FEET
2 510 000 FEET
345 000 FEET
360 000 FEET

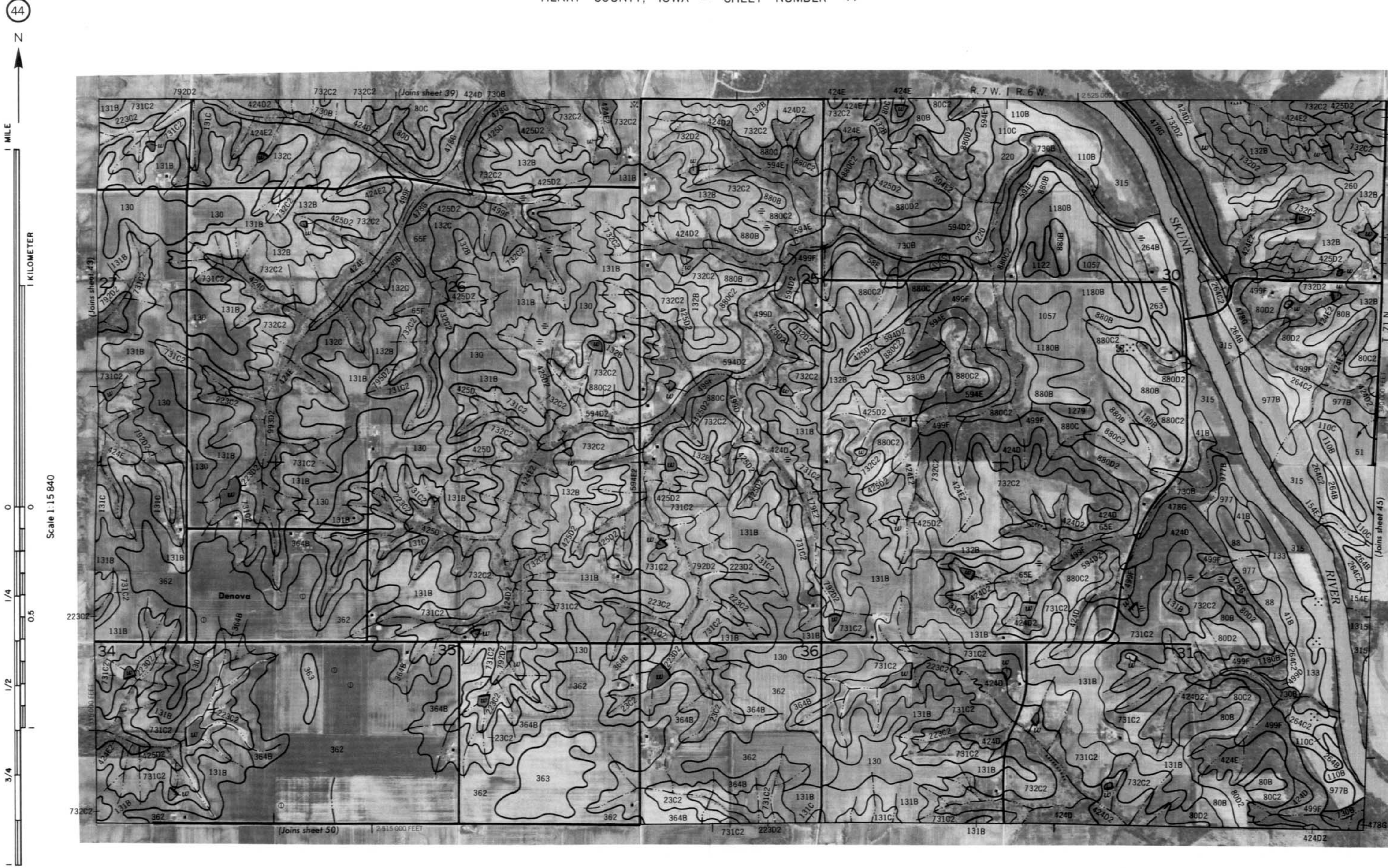

39
N
SKUNK RIVER
BIG CREEK
Oakland Mills
OAKLAND MILLS STATE PARK
SKUNK RIVER
(Joins sheet 34)
(Joins sheet 38)
(Joins sheet 40)
(Joins sheet 44)
R. 7 W.
R. 6 W.
T. 71 N.
2 515 000 FEET
2 525 000 FEET
350 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
water

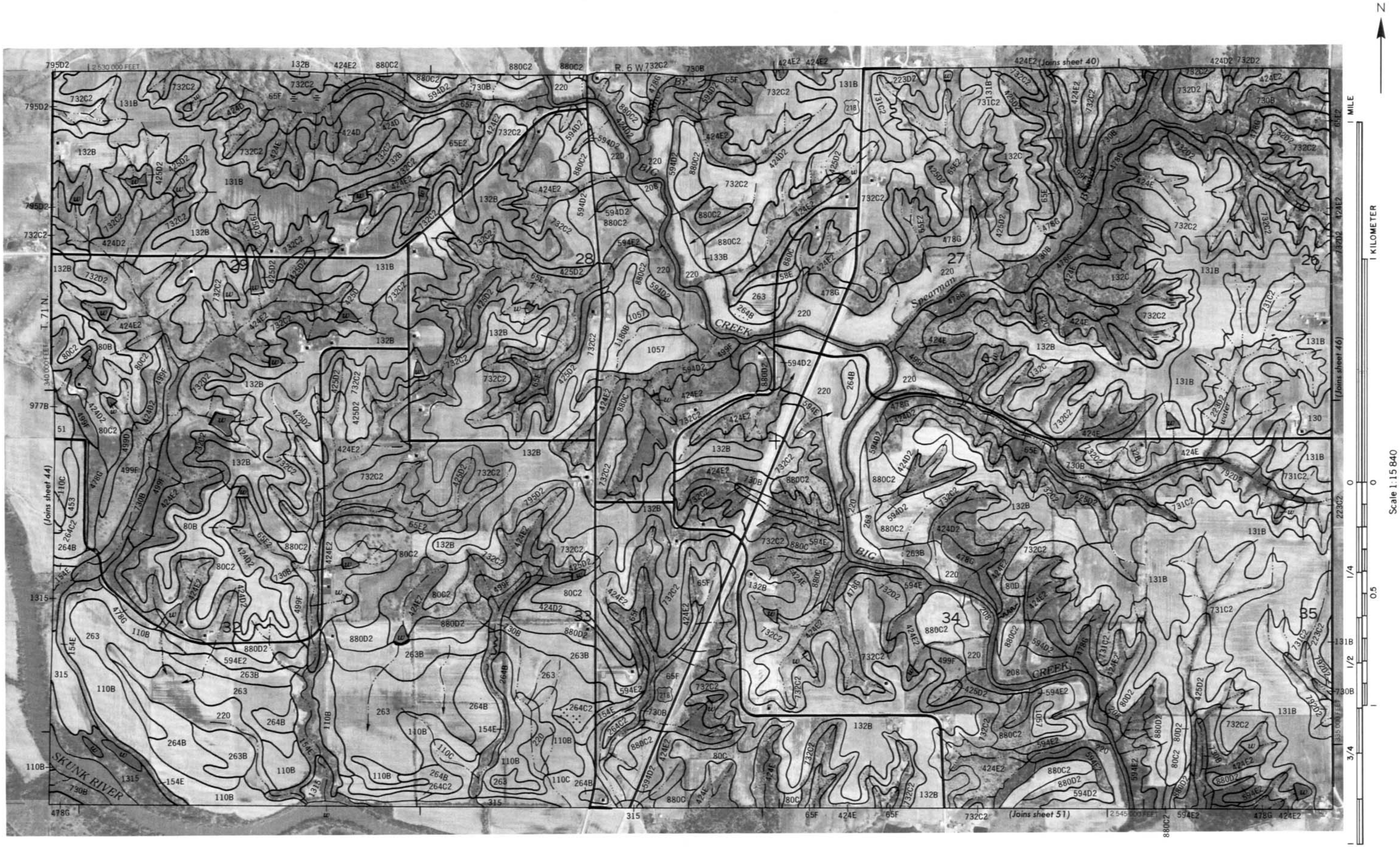

40
N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
(Joins sheet 35)
(Joins sheet 39)
(Joins sheet 41)
(Joins sheet 45)
R. 6 W.
T. 71 N.
MOUNT PLEASANT
(county seat)
2 545 000 FEET
2 530 000 FEET
345 000 FEET
355 000 FEET
BIG
CREEK
Heather
Branch
17
16
15
14
20
21
22
23
water

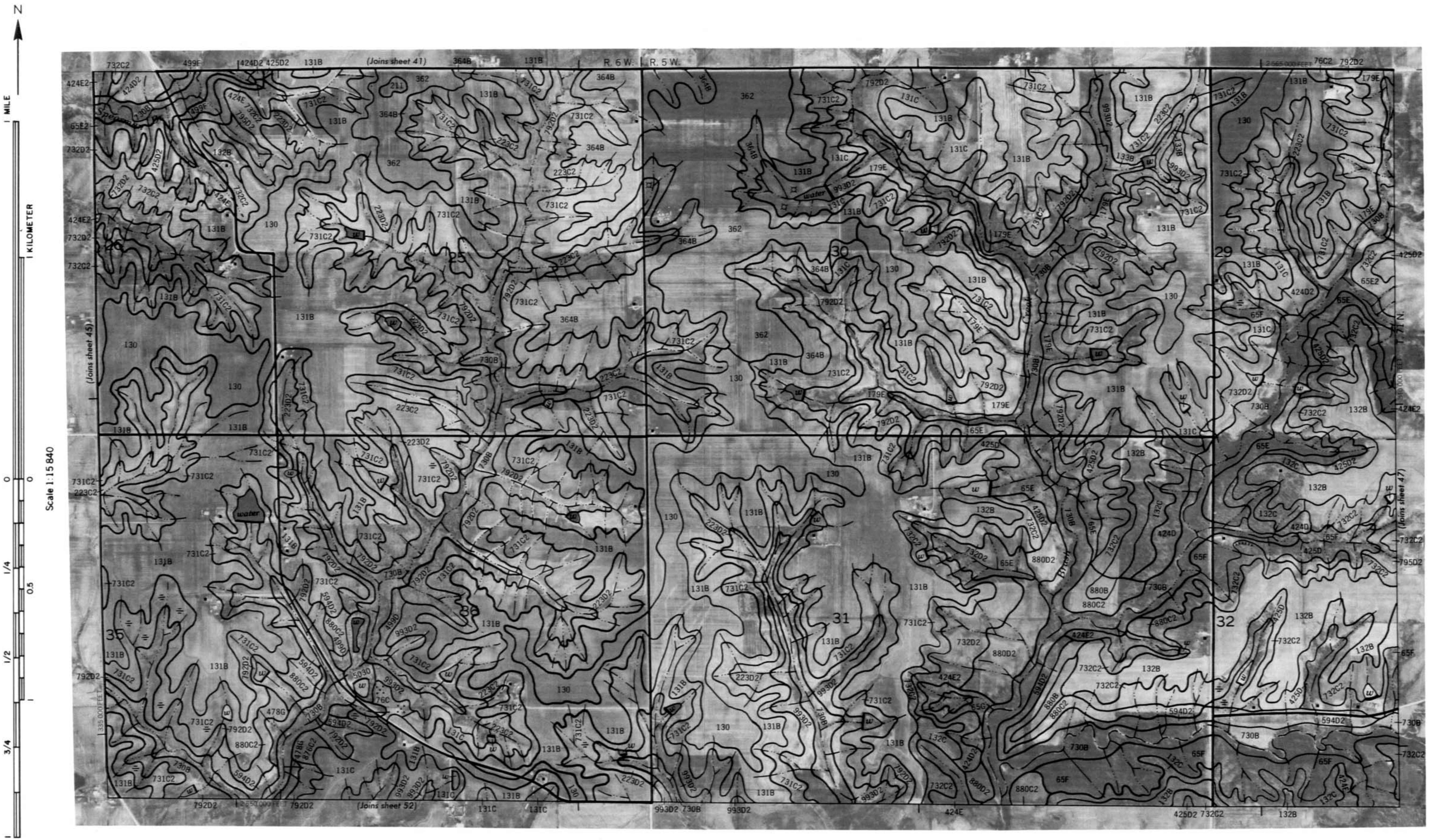

N
(Joins sheet 36)
(Joins sheet 42)
(Joins sheet 46)
(Joins sheet 40)
R. 6 W.
R. 5 W.
T. 71 N.
2 550 000 FEET
2 565 000 FEET
355 000 FEET
345 000 FEET
MT. PLEASANT
CITY AIRPORT
BURLINGTON
NORTHERN
Branch
Spearman
Brush
Cr.
13
14
17
18
19
20
23
24
1 MILE
1 KILOMETER
0
1/4
1/2
3/4
0.5
Scale 1:15 840

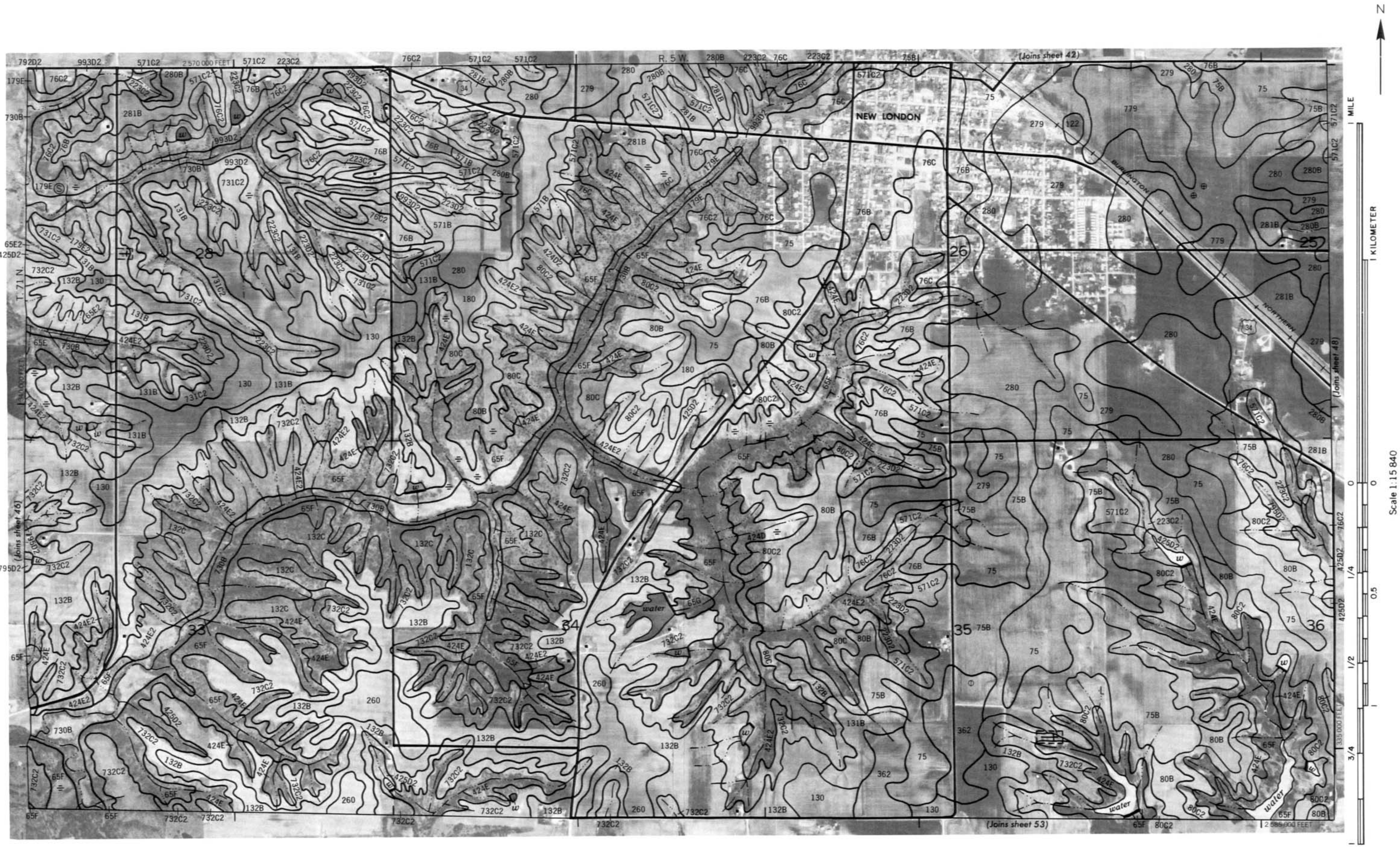

42
N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
(Joins sheet 37)
R. 5 W.
2 585 000 FEET
355 000 FEET
(Joins sheet 41)
T. 71 N.
(Joins inset C, sheet 27)
(Joins sheet 47)
2 570 000 FEET
345 000 FEET
16
15
14
13
21
22
23
24
BURLINGTON
NORTHERN
NEW LONDON
water
34

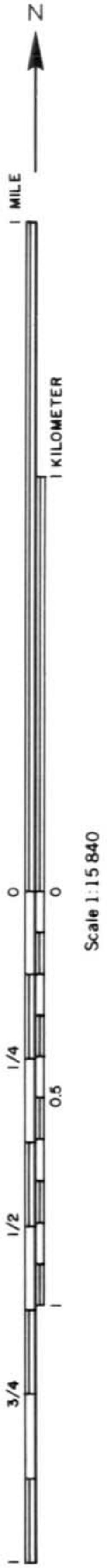

N
R. 7 W.
T. 71 N.
2 495 000 FEET
340 000 FEET
(Joins sheet 38)
(Joins sheet 44)
(Joins sheet 49)
JEFFERSON COUNTY
CEDAR CREEK
28
29
30
31
32
33
34
27
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

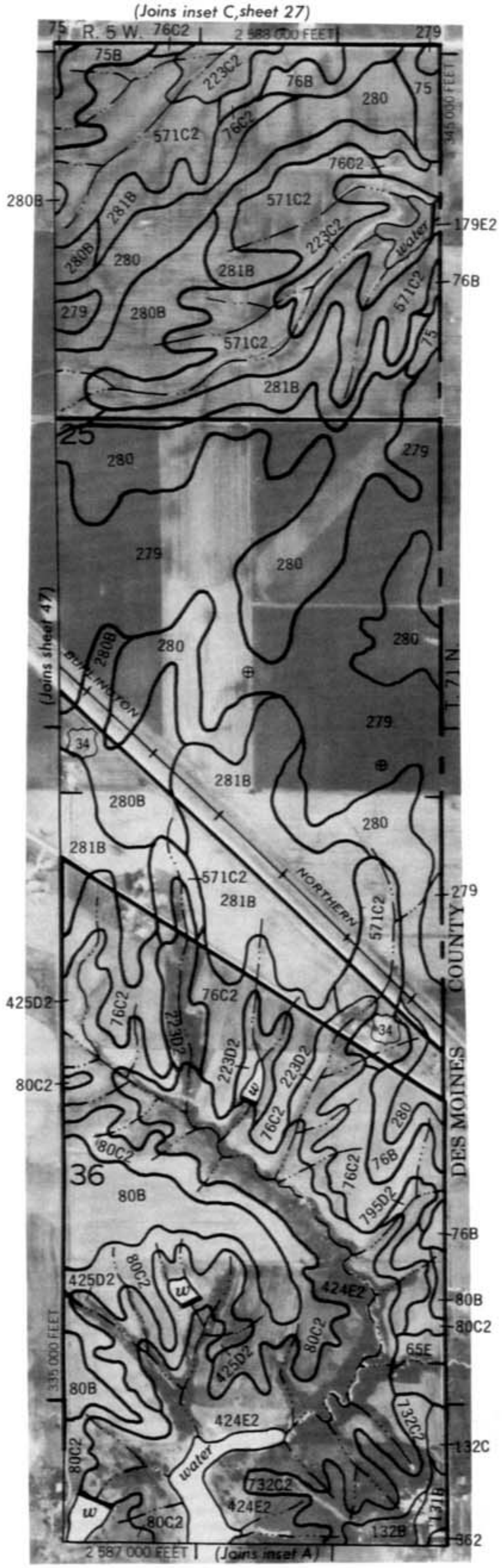

44
N
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
1
0.5
(Joins sheet 39)
(Joins sheet 43)
(Joins sheet 45)
(Joins sheet 50)
R. 7 W.
R. 6 W.
T. 71 N.
2 525 000 FEET
2 515 000 FEET
Denova
SKUNK
RIVER
25
26
27
30
31
34
35
36


N
R. 6 W.
T. 71 N.
2 530 000 FEET
340 000 FEET
2 545 000 FEET
335 000 FEET
(Joins sheet 40)
(Joins sheet 46)
(Joins sheet 51)
(Joins sheet 44)
BIG CREEK
Spearman
SKUNK RIVER
218
26
27
28
29
32
33
34
35
1 MILE
3/4
1/2
1/4
0
1 KILOMETER
0.5
Scale 1:15 840


N
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 41)
(Joins sheet 45)
(Joins sheet 47)
(Joins sheet 52)
R. 6 W.
R. 5 W.
T. 71 N.
25
26
29
30
31
32
35
36
water

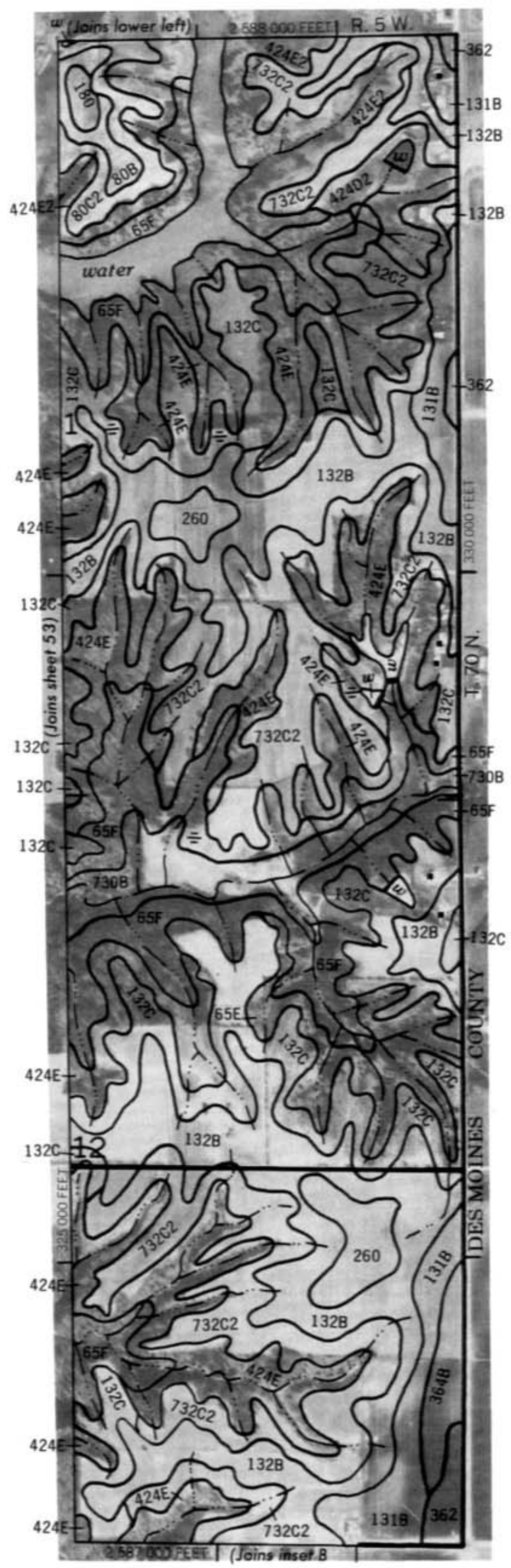

(Joins sheet 42)
(Joins sheet 48)
(Joins sheet 53)
(Joins sheet 46)
NEW LONDON
R. 5 W.
T. 71 N.
BURLINGTON
NORTHERN
2 570 000 FEET
2 585 000 FEET
water
25
26
27
28
33
34
35
36
N
1 MILE
1 KILOMETER
Scale 1:15 840





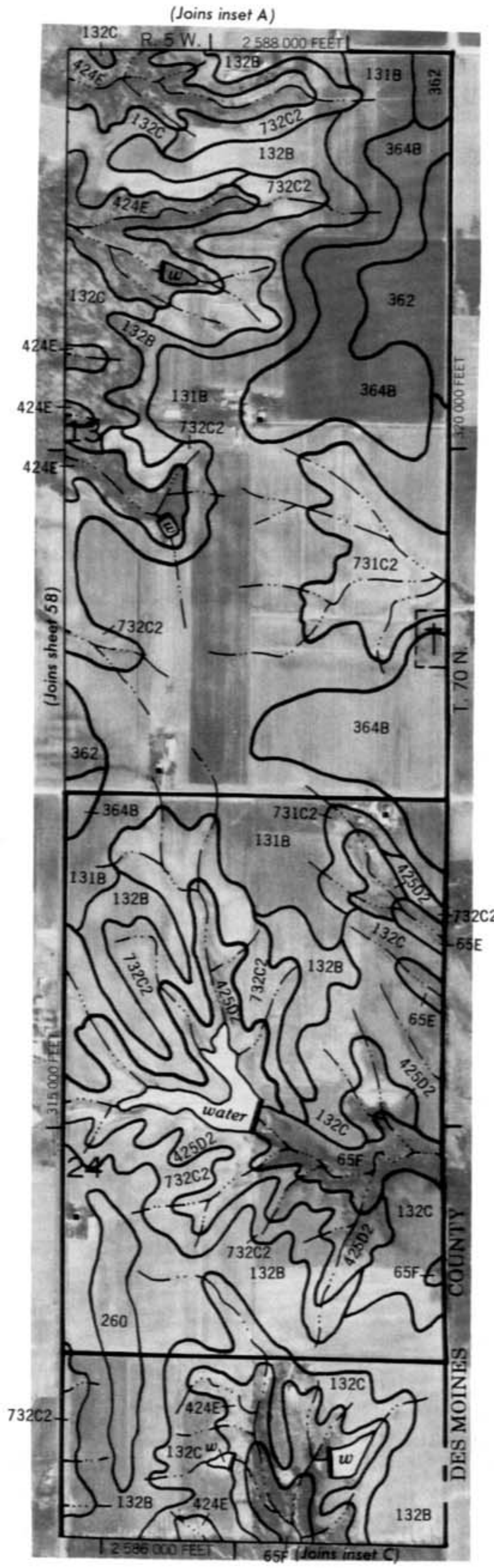
1000 AND 5000-FOOT GRID TICKS

INSET A



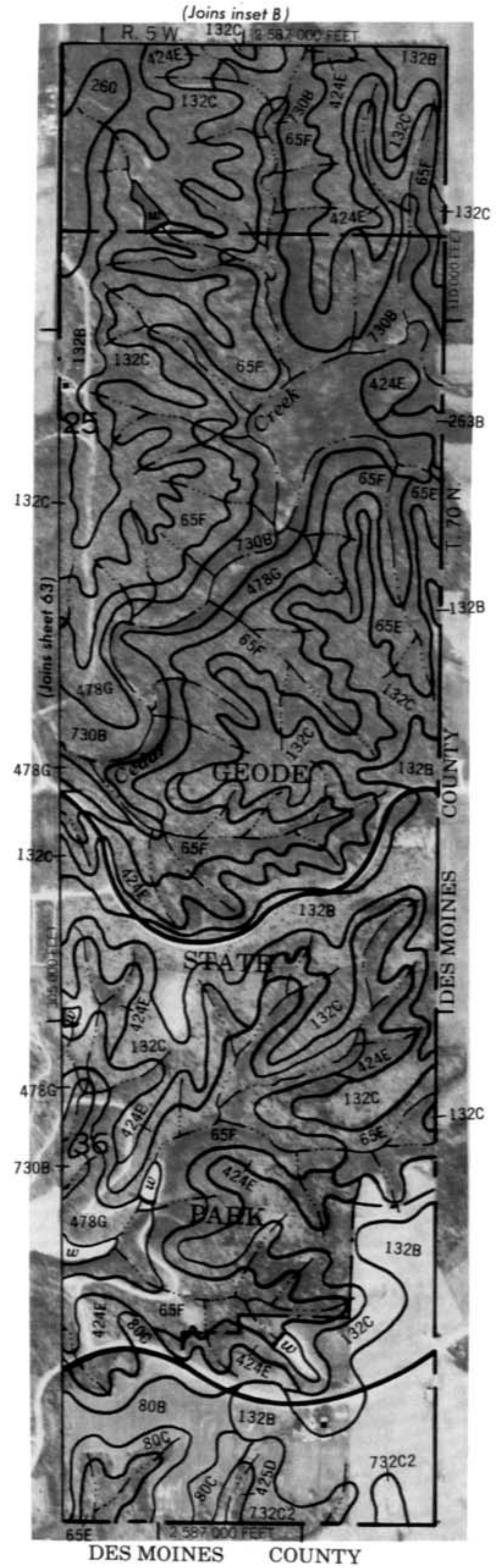
1000 AND 5000-FOOT GRID TICKS

INSET B

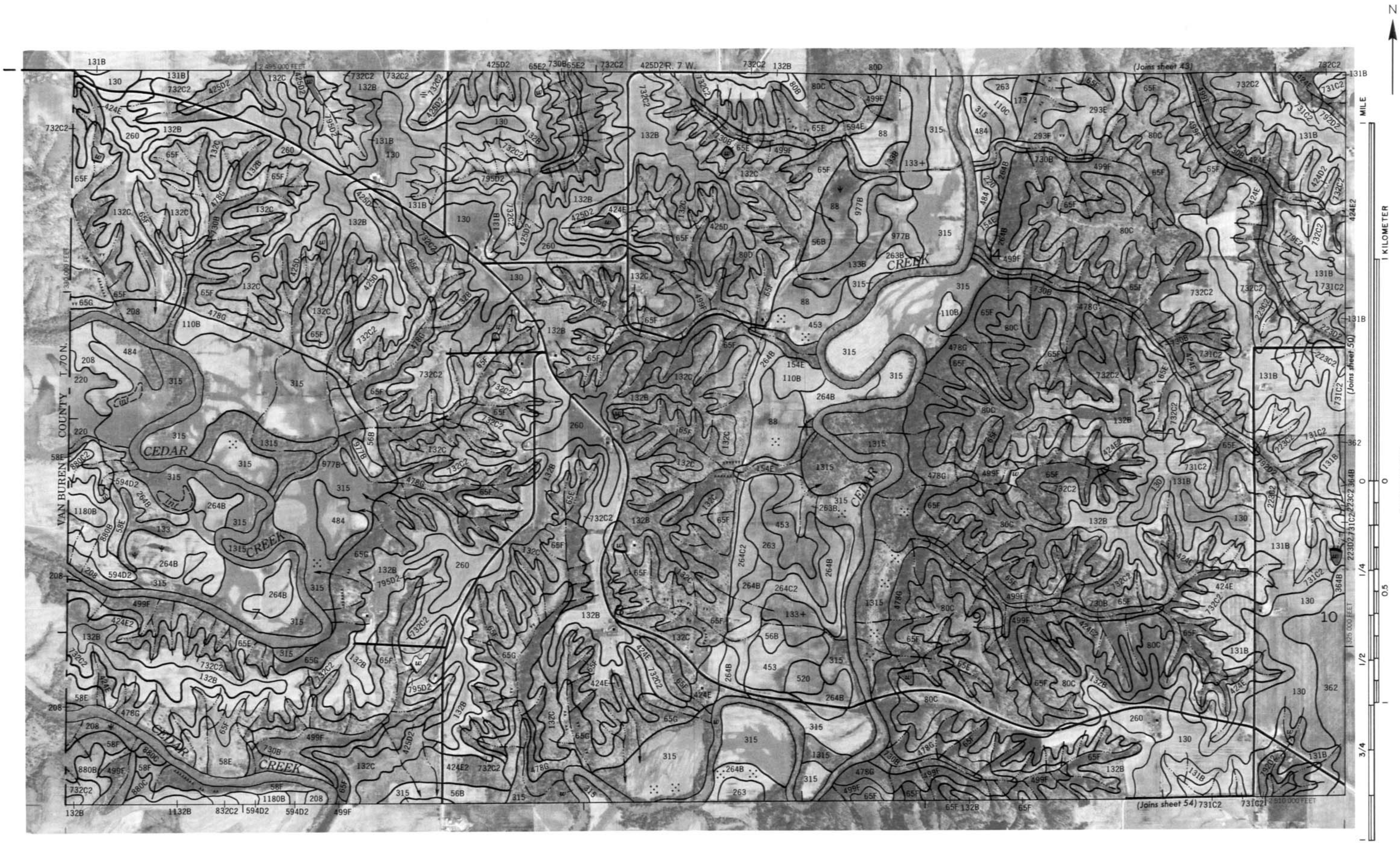


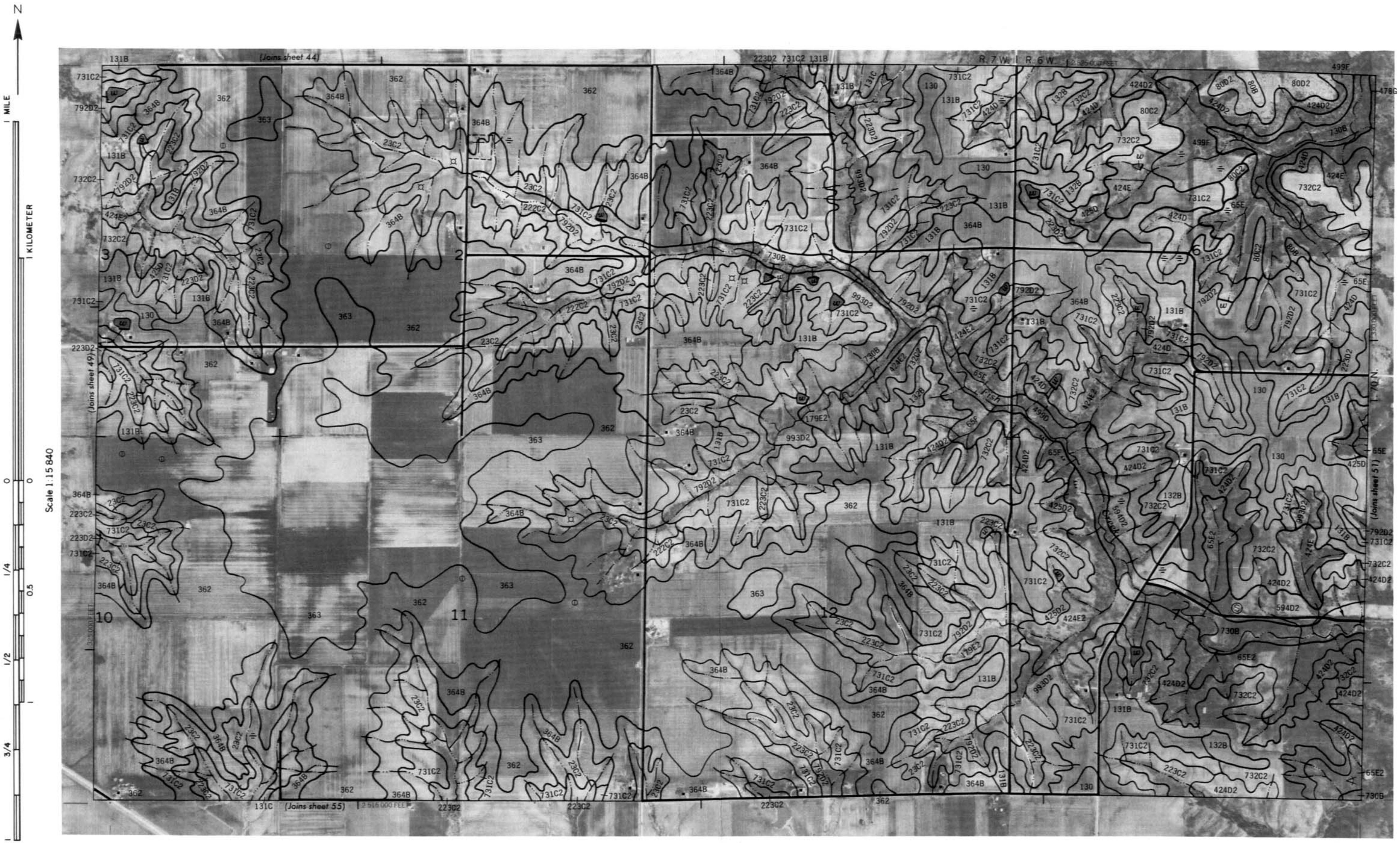
1000 AND 5000-FOOT GRID TICKS

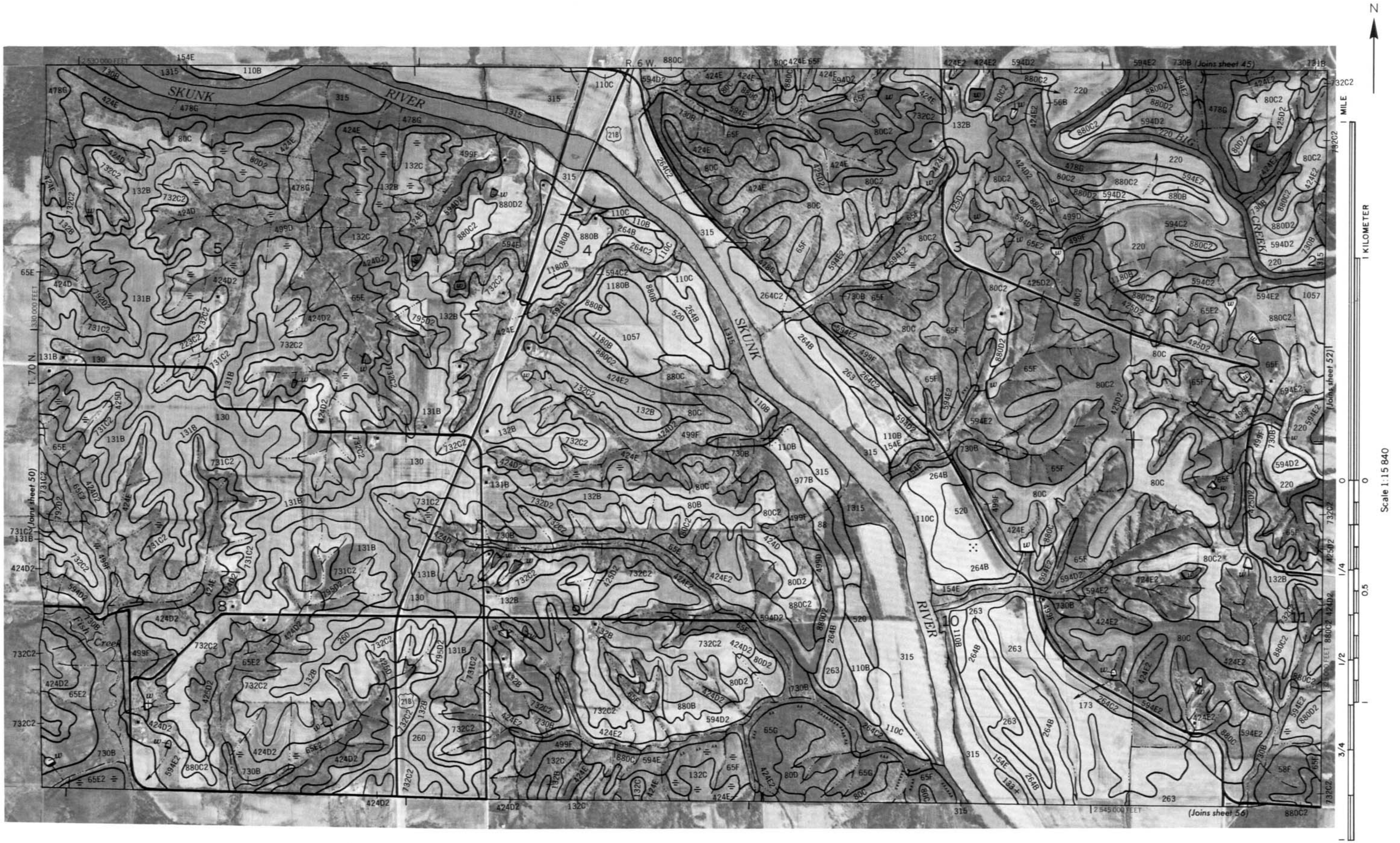
INSET C



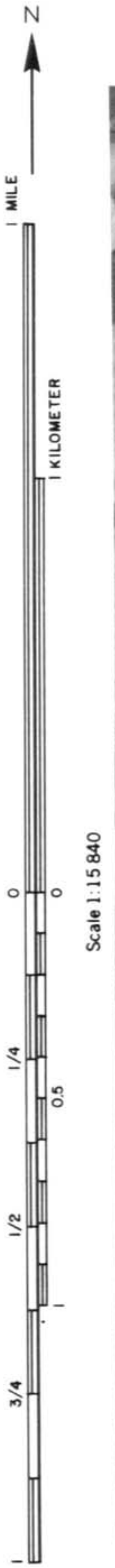
1000 AND 5000-FOOT GRID TICKS

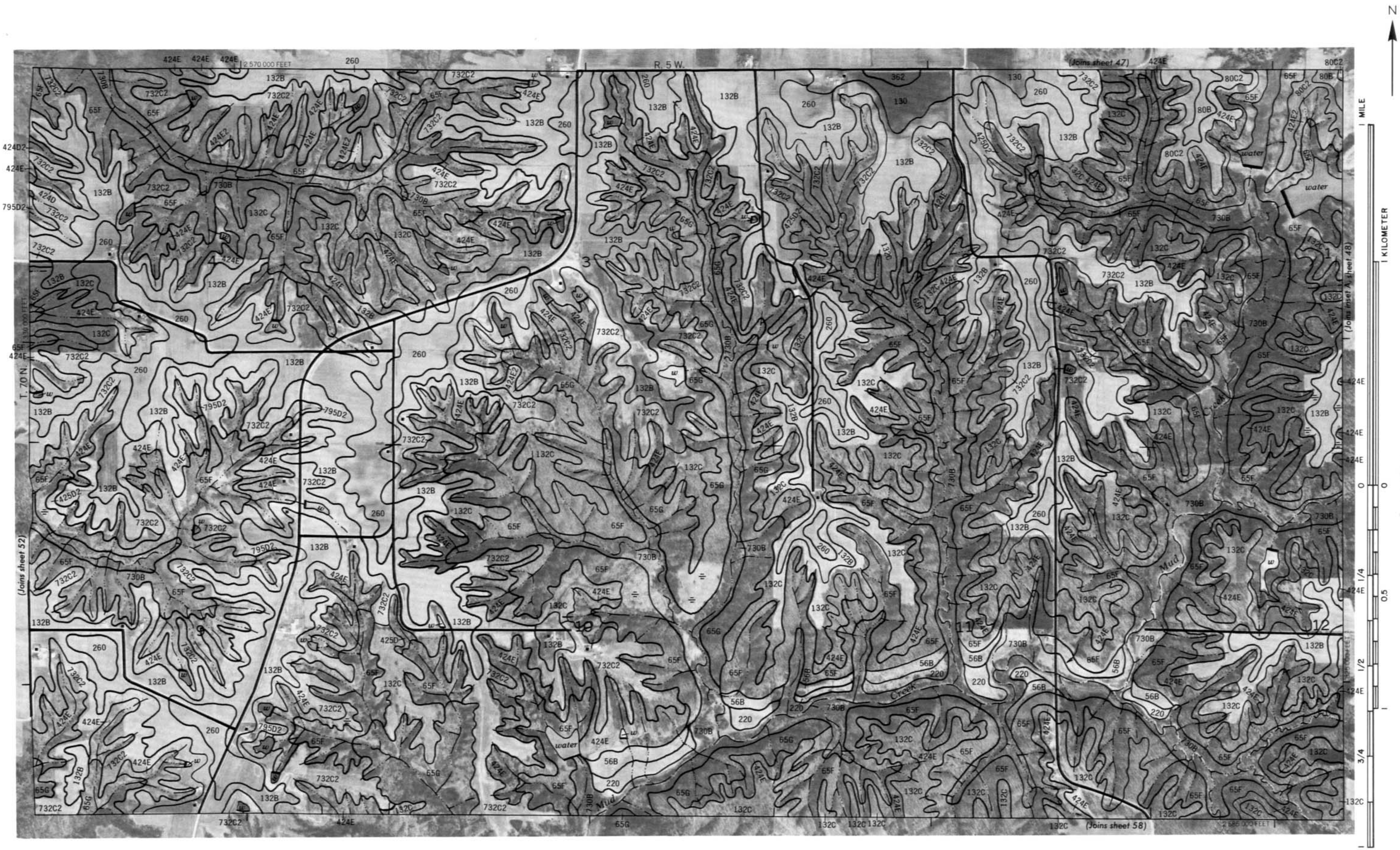

N
(Joins sheet 43)
(Joins sheet 50)
(Joins sheet 54)
R. 7 W.
T. 70 N.
VAN BUREN COUNTY
CEDAR CREEK
1 MILE
1 KILOMETER
Scale 1:15 840


N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
(Joins sheet 44)
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 55)
R. 7 W. | R. 6 W.
T. 70 N.
Fish

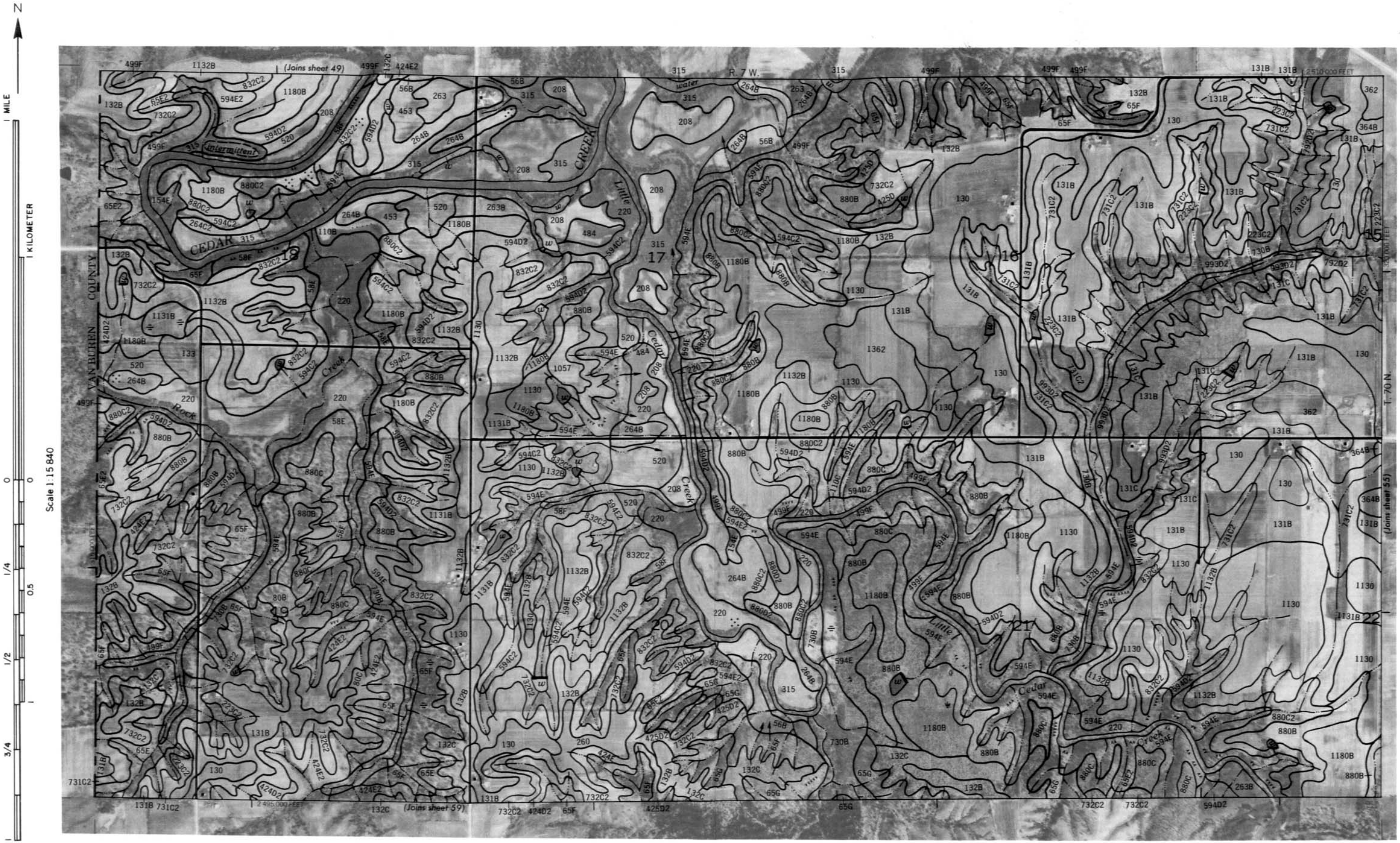

51
N
SKUNK RIVER
BIG CREEK
Fish Creek
R. 6 W.
T. 70 N.
(Joins sheet 45)
(Joins sheet 50)
(Joins sheet 52)
(Joins sheet 56)
2 530 000 FEET
2 545 000 FEET
330 000 FEET
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5

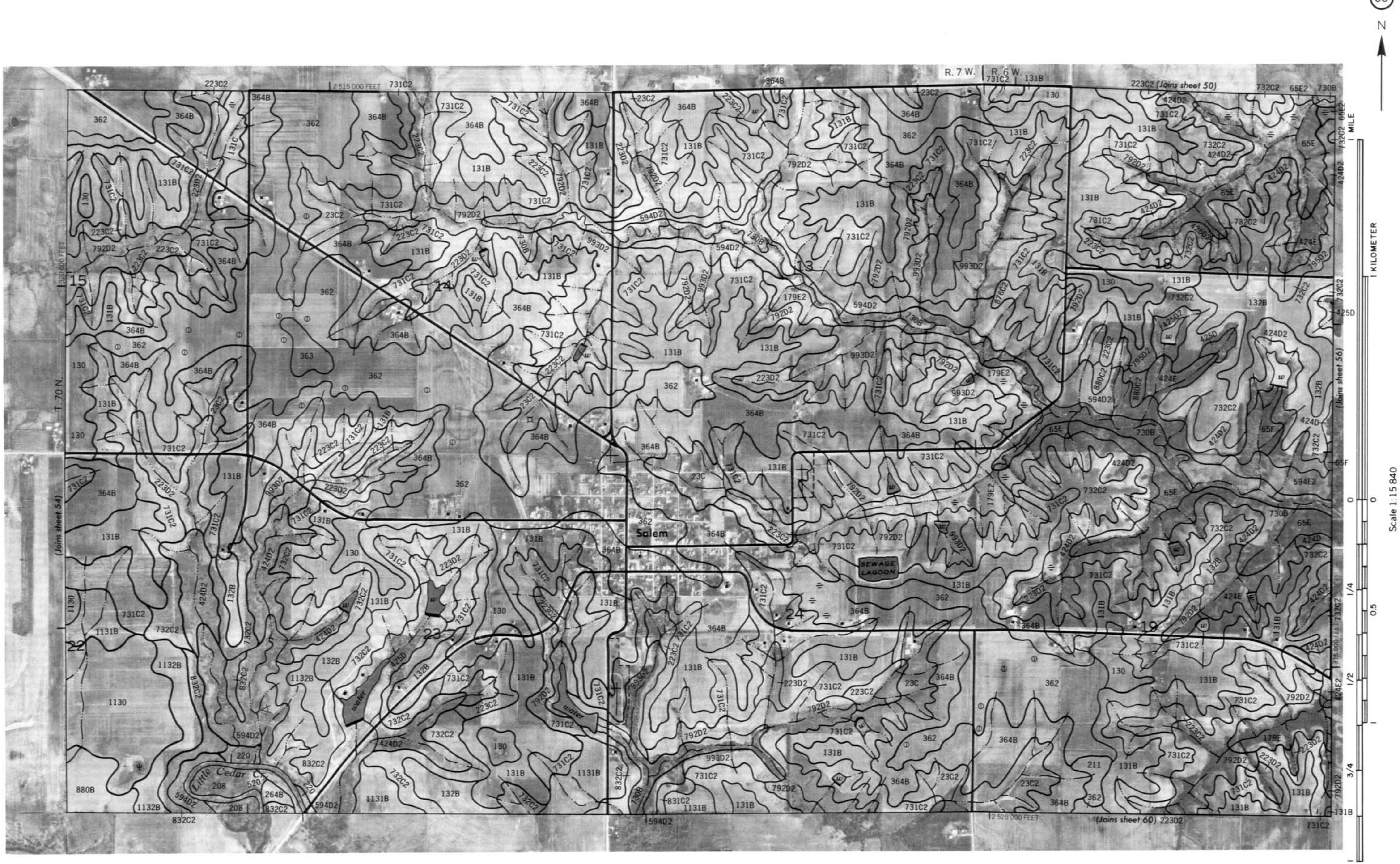
HENRY COUNTY, IOWA — SHEET NUMBER 52

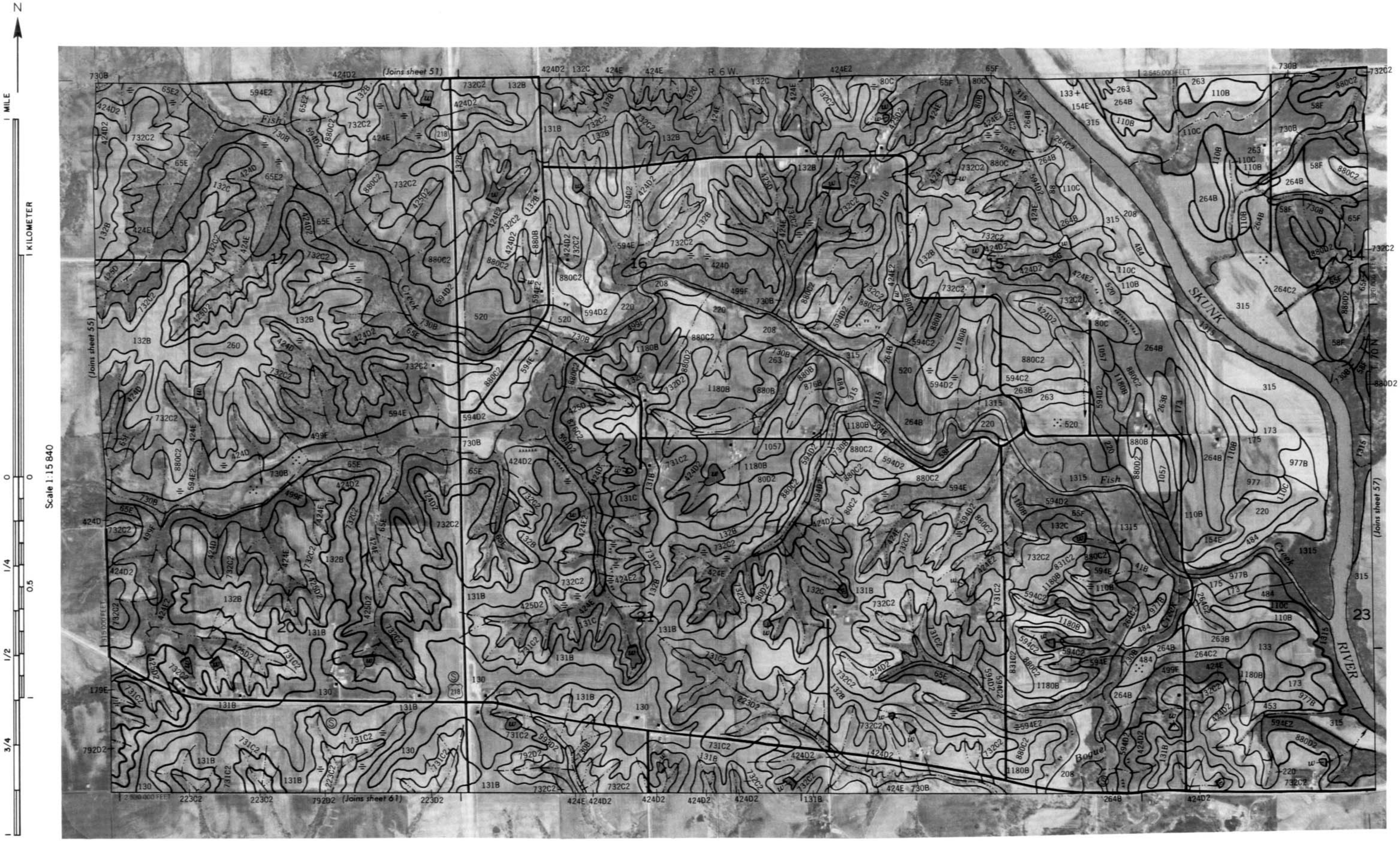



N
(Joins sheet 47)
R. 5 W.
2 570 000 FEET
T. 70 N.
(Joins sheet 52)
(Joins inset A, sheet 48)
(Joins sheet 58)
2 585 000 FEET
Mud Creek
water
1 MILE
1 KILOMETER
Scale 1:15 840

54

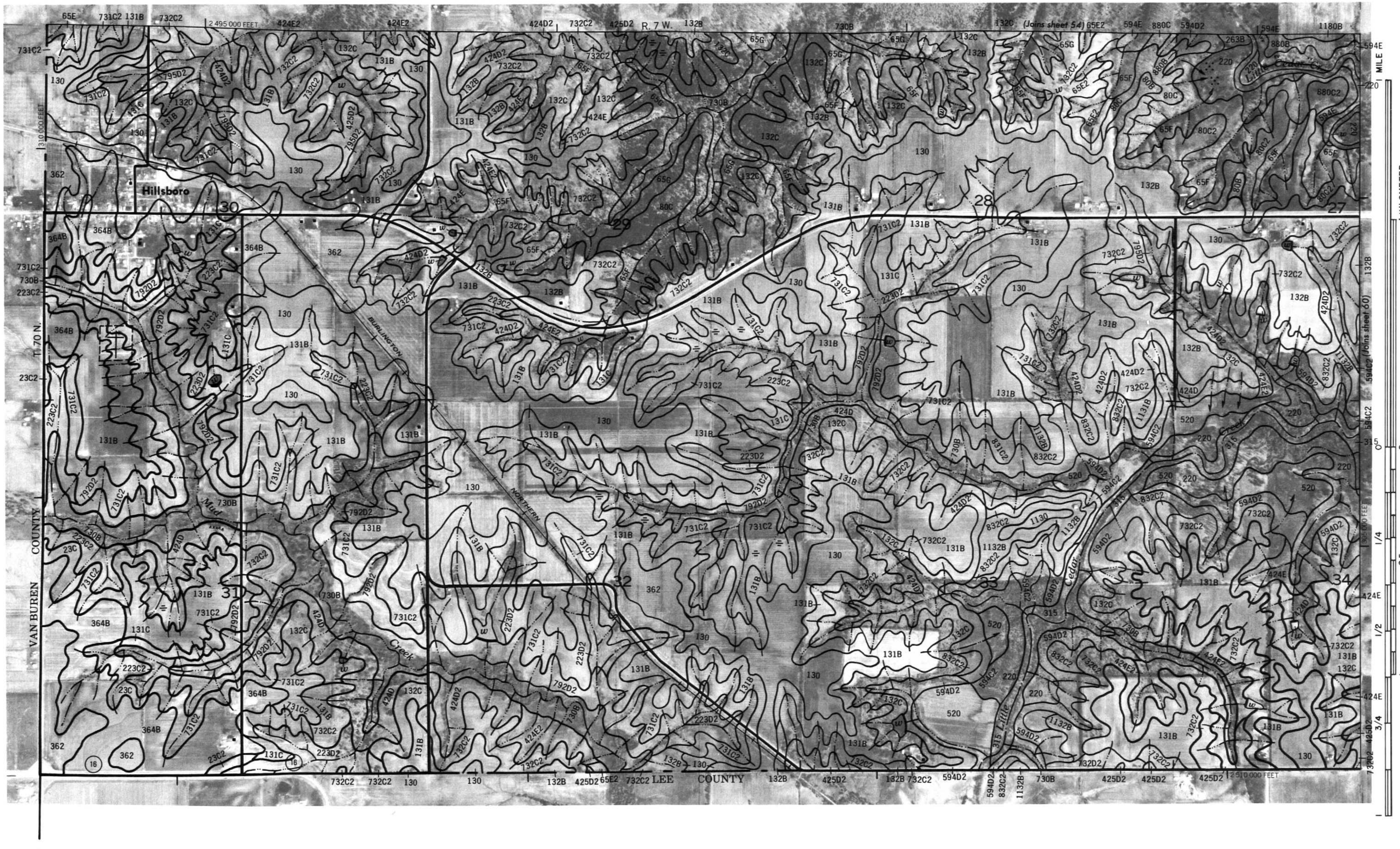

N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
1
(Joins sheet 49)
(Joins sheet 59)
(Joins sheet 55)
R. 7 W.
T. 70 N.
VAN BUREN COUNTY
CEDAR
Intermittent
Little
CREEK
Cedar
Creek
Rock
Creek
water
17
18
16
15
19
20
21
22
2 510 000 FEET
2 495 000 FEET


N
R. 7 W.
R. 6 W.
T. 70 N.
2 515 000 FEET
2 525 000 FEET
(Joins sheet 50)
(Joins sheet 54)
(Joins sheet 56)
(Joins sheet 60)
Salem
SEWAGE LAGOON
Little Cedar Cr.
water
1 MILE
1 KILOMETER
Scale 1:15 840


N
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5
1
(Joins sheet 51)
(Joins sheet 55)
(Joins sheet 57)
(Joins sheet 61)
R. 6 W.
2 545 000 FEET
315 000 FEET
2 530 000 FEET
SKUNK
RIVER
Fish
Creek
Bogue
Creek
14
15
16
17
20
21
22
23

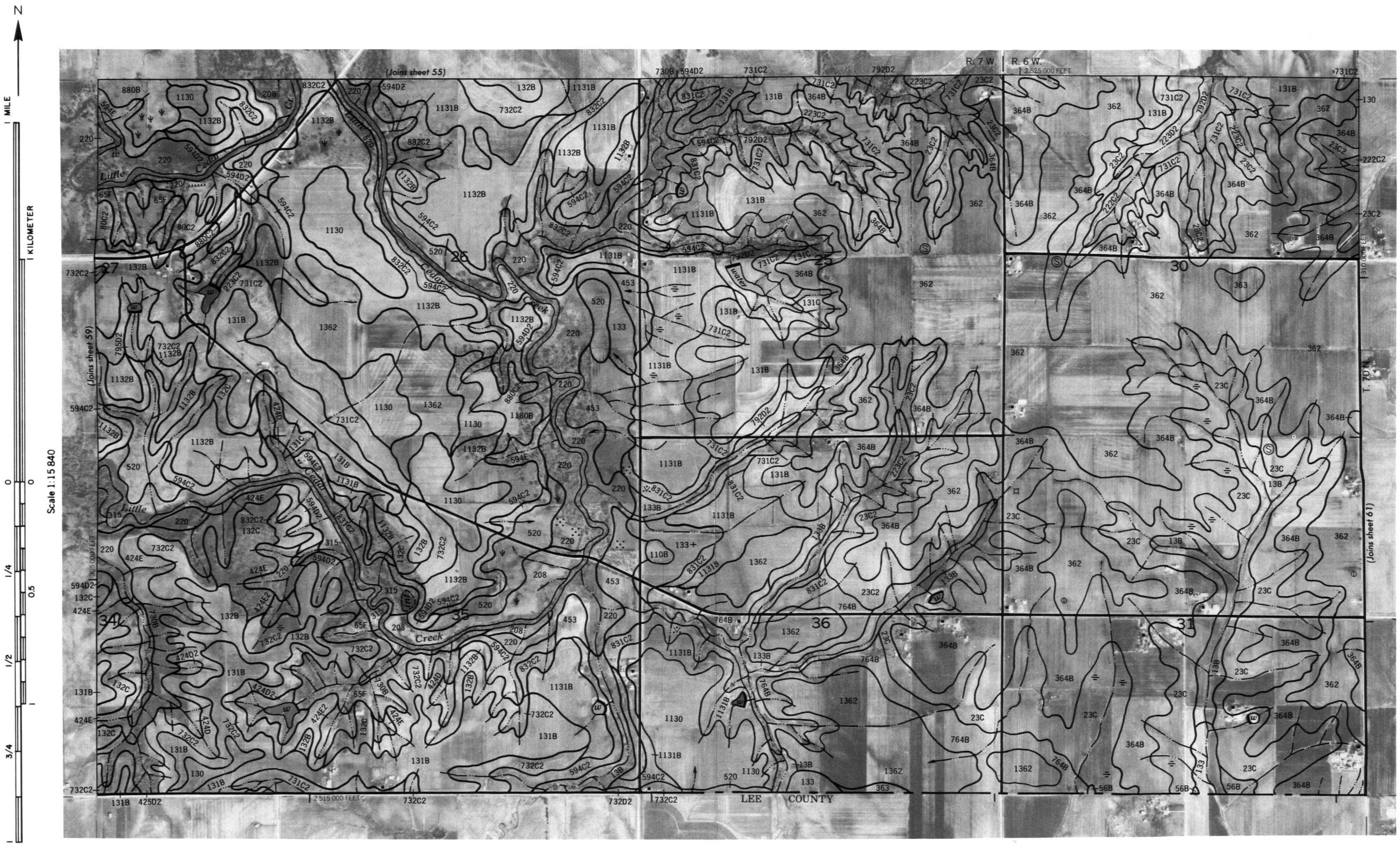

N
R. 6 W. | R. 5 W.
(Joins sheet 52)
(Joins sheet 56)
(Joins sheet 58)
(Joins sheet 52)
T. 70 N.
BIG CREEK
SKUNK RIVER
SKUNK RIVER
13
14
17
18
19
20
23
24
1 MILE
1 KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0
0.5


N
MILE
KILOMETER
Scale 1:15 840
0
1/4
1/2
3/4
0.5
(Joins sheet 53)
R. 5 W.
T. 70 N.
(Joins sheet 57)
(Joins inset B, sheet 48)
(Joins sheet 63)
Mud Creek
6
13
14
15
21
22
23
24



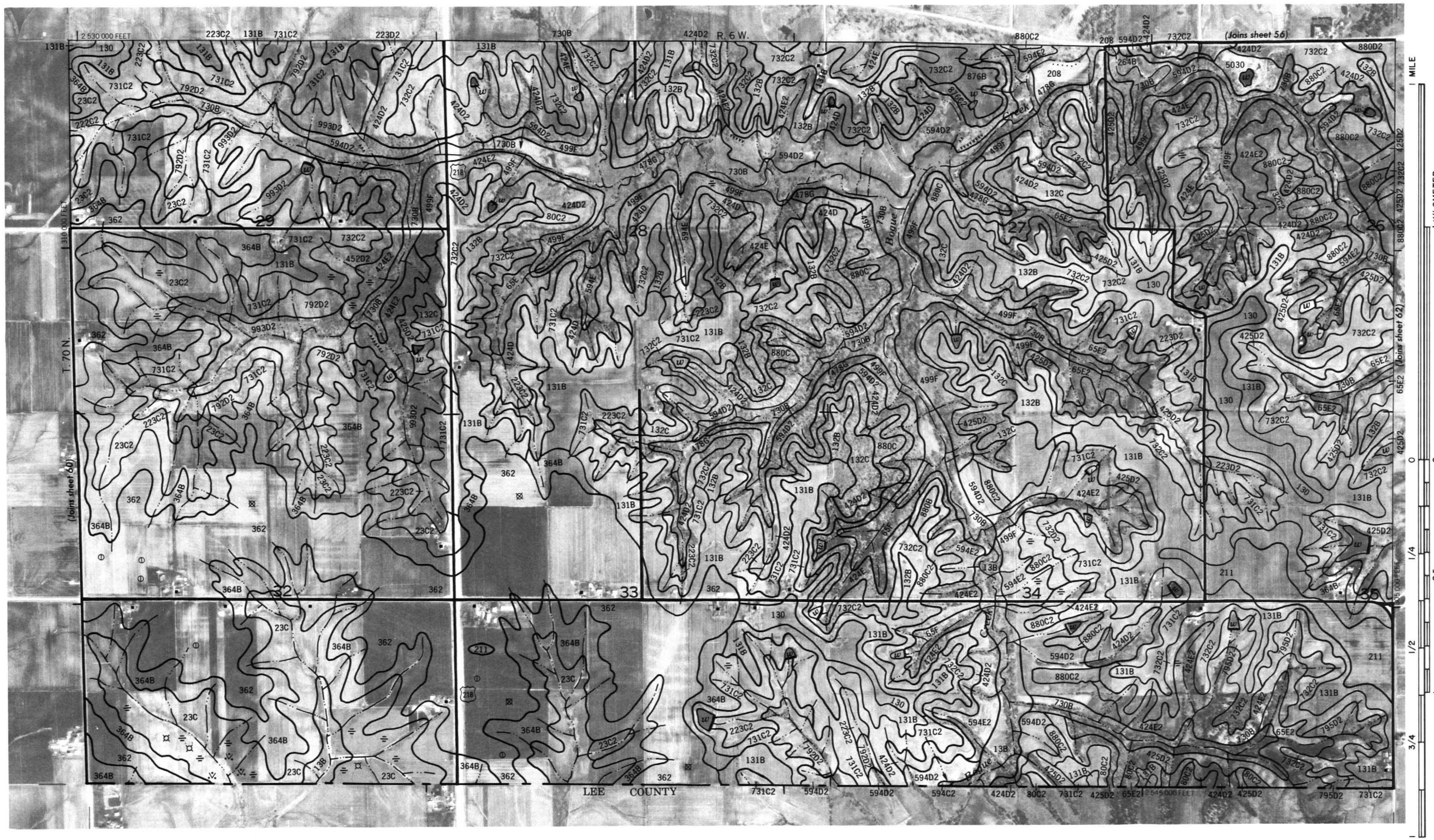
HENRY COUNTY, IOWA NO. 59

This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

N



Scale 1:15 840

HENRY COUNTY, IOWA NO. 61

This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

62

N

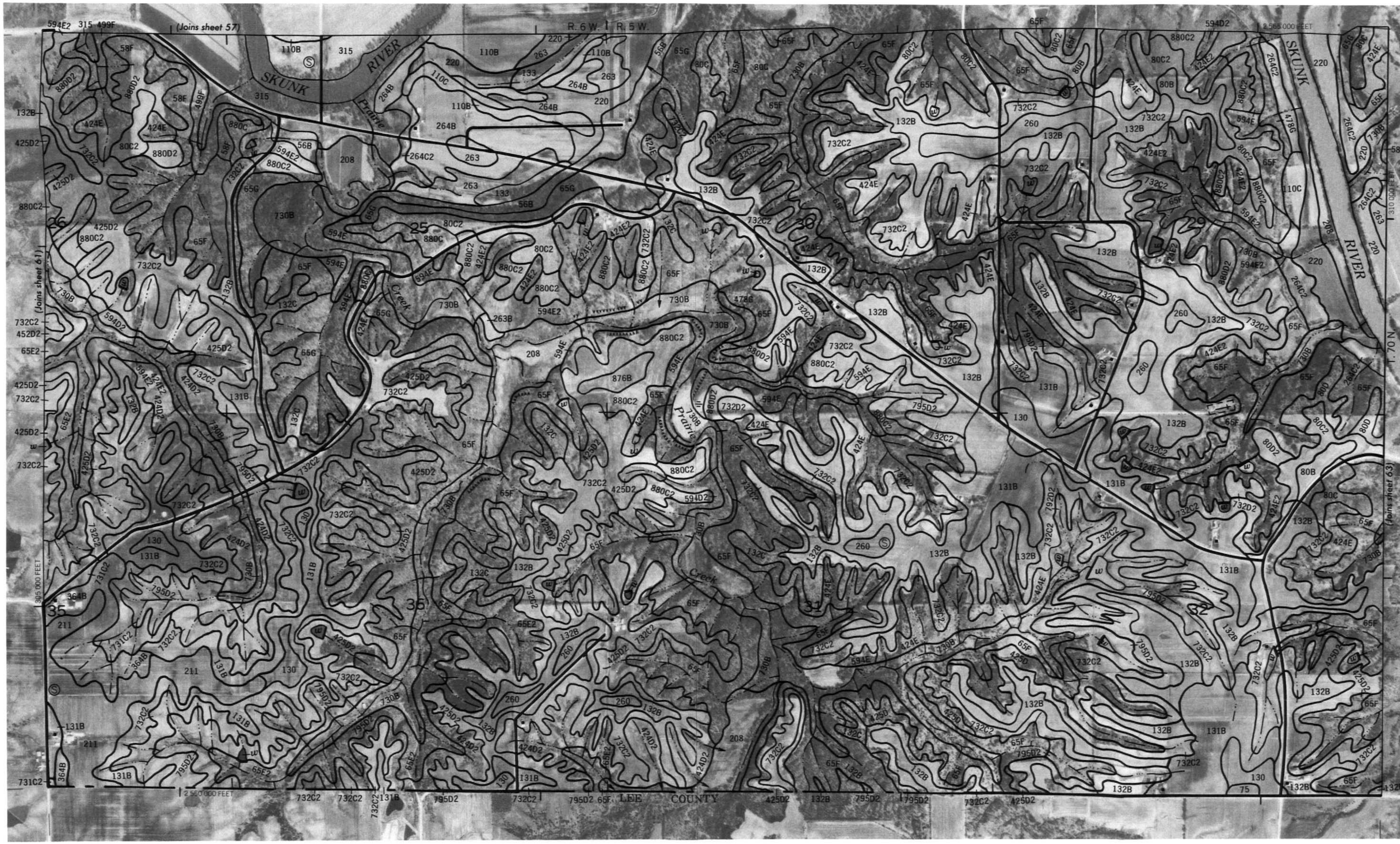
1 MILE

1 KILOMETER

Scale 1:15 840

0 1/4 1/2 3/4 1

0 0.5 1



This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This map is compiled on 1978 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.